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WCleco Comment No. 4 - Review of CAMx Modeling
Although the proposed rule indicates that BART-eligible sources at Brame Energy Center are BART applicable, Cleco believes the sources at Brame Energy Center were shown through its previous CAMx modeling not to have a significant impact above the 0.5 dv threshold and are, therefore, not subject to BART. This conclusion is primarily based on the following two factors:

1. CAMx modeling is clearly superior to CALPUFF modeling when considering the relatively long distances between the modeled source and the Class I areas; and
2. The protocol for the CAMx modeling-runs for the Brame Energy Center was proper and minimizes potential bias. The EPA CAMx modeling results conducted by a different protocol resulted in predictions that are substantially different from the IMPROVE monitor data showing the predictions to be biased. This includes over-prediction of nitrate concentrations, a species that contributes to most of the Brame Unit 2 maximum modeled impact.

Based on the CAMx modeling, the maximum impacts from the Rodemacher 2 unit are 0.013 dv at Breton Wilderness Area and 0.008 dv at Caney Creek Wilderness Area, which are insignificant relative to overall visibility impairment. The attached comments prepared by Trinity Consultants for Cleco, Comments on U.S. EPA's Louisiana Best Available Retrofit Technology Assessment and Proposed SIP Approval, provide additional justification for the CAMx modeling analysis and refutes EPA's criticism in the proposed rule and TSD concerning modeling conducted for the Brame Energy Center. As a result of this analysis, it is plain that the CAMx modeling was performed properly and shows that the Brame Energy Center units have insignificant impact to any Class I area. Therefore, Cleco believes both units should have been characterized as not subject to BART by LDEQ and EPA.

WAn initial CAMx modeling analysis was submitted on January 14, 2016 as part of Cleco's BART screening analysis for Brame and Teche.[1] EPA responded to this initial CAMx assessment on March 16, 2016,[2] and although Cleco disagreed with the technical basis of EPA's requests in this response, a revised modeling analysis was submitted on June 1, 2016.[3] Cleco maintains that based on this modeling, Cleco's BART-eligible sources have minimal predicted impacts on visibility at Class I areas and should therefore not be subject to BART.

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[1] Trinity Consultants, Updated BART Applicability Screening Analysis (Jan. 12, 2016). Submitted to Mr. Guy R. Donaldson (EPA) by Mr. Bill Matthews (Cleco) on Jan. 14, 2016 (January 2016 Submittal).
[2] Mr. Guy R. Donaldson, "EPA Preliminary Review Response." Letter to Mr. Bill Matthews (Mar. 16, 2016).
[3] Trinity Consultants, Updated BART Applicability Screening Analysis (May 31, 2016). Submitted to Mr. Guy R. Donaldson (EPA) by Mr. Bill Matthews (Cleco) on June 1, 2016 (June 2016 Submittal).

As stated in LDEQ's SIP revision submittal, Cleco presented LDEQ with CAMx modeling as demonstration that Cleco's BART-eligible facilities have minimal visibility impact on Class I areas.[4] Cleco's initial modeling assessment submitted on January 14, 2016 (January 2016 Submittal) evaluated Cleco's BART-eligible sources with the maximum annual emission rates from the original baseline period of 2000-2004. Utilizing the same post-processing methodology for CAMx visibility assessments that was used in the CAMx modeling performed in support of the Oklahoma and Texas Regional Haze Federal Implementation Plan (FIP),[5] the impacts from Cleco's BART-eligible sources were found to be negligible. The maximum impacts during the worst 20% visibility days from Brame Unit 2 were 0.013 dv at the Breton Wilderness Area (Breton) and 0.008 dv at the Caney Creek Wilderness Area (Caney Creek), thereby supporting the conclusion that Cleco's facilities contribute only very minimally to visibility impairment at Class I areas.[6]

Entergy believes that EPA's analysis supporting other elements of the Proposed Rule are fundamentally flawed. Specifically, the CAMx and CALPUFF modeling that support the rulemaking contain significant defects, making the modeling far less reliable than the CAMx modeling Entergy submitted to the Agency in November 2015. The more reliable results from Entergy's modeling clearly indicate that Entergy's BART-eligible facilities in Louisiana should not be determined to be subject to BART. Nevertheless, Entergy agrees with the proposed BART limits for these units.

Entergy supports portions of EPA's proposed partial approval of LDEQ's SIP revision, but objects to a number of significant issues in EPA's evaluation of Entergy's previously submitted Comprehensive Air Quality Model with Extensions (CAMx) modeling and EPA's own CAMx assessment. Specifically, EPA should reconsider its evaluation of Entergy's CAMx modeling, as the Agency's concerns about the accuracy of these modeling results are unfounded. These comments address technical issues related to EPA's assessment of Entergy's CAMx modeling analyses, as well as problems with EPA's own CAMx modeling methodology and performance evaluation. The comments also address deficiencies with the CALPUFF modeling system, as described in previous Entergy submittals to EPA and LDEQ. Although EPA has opted to defer its decision regarding Entergy's Roy S. Nelson Electric Generating Plant (Nelson) to a future rulemaking, EPA's CAMx modeling assessment included the Nelson facility. Therefore, in addition to problems with EPA's general CAMx modeling approach, Entergy has also identified specific problems related to EPA's modeling of Nelson. Importantly, Entergy's CAMx modeling remains the most reliable estimation of visibility impacts from Entergy's BART-eligible facilities, and demonstrates that these facilities should not be subject to BART.

EPA's requested post-processing methodology is unreliable and criticisms of Entergy's post-processing methodology are flawed. In the CAMx Modeling TSD, EPA critiques

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[4] SIP Revision Submittal, p. 10.
[5] EPA, Technical Support Document for the Oklahoma and Texas Regional Haze Federal Implementation Plans (Nov. 2014), Docket No. EPA-R06-OAR-2014-0754-0007 (Texas Reasonable Progress FIP TSD).
[6] January 2016 Submittal, p. 1-1.

the post-processing methodologies used by Entergy. Entergy has provided comments on multiple occasions as to why its modeling is based on the most technically defensible methodologies: first, in the 2016 CAMx Modeling Report, and again in Entergy's April 2017 letter to LDEQ. The modeling analysis included in the November 2015 Submittal represents the most appropriate post-processing analysis of CAMx modeling results; however, EPA's focus in the CAMx Modeling TSD is on the post-processing approach included in Entergy's June 2016 Submittal. Entergy also provides responses to specific critiques made by EPA regarding this post-processing approach.

WIn response to concerns about the application of CALPUFF at distances greater than the typical distance threshold and the general unreliability of CALPUFF due to its simplified chemistry mechanism, the University of North Carolina at Chapel Hill (UNC-IE) assisted EPA in performing CAMx modeling of several coal-fired EGUs in Louisiana that are BART-eligible. In the Proposed Rule, EPA notes that CAMx "provides a scientifically validated platform for assessment of visibility impacts over a wide range of source-to-receptor distances."[7] Further, the CAMx Modeling TSD states that CAMx "has a more robust chemistry mechanism than CALPUFF" making it "more suited than some other modeling approaches for evaluating the impacts of SO_2, NO_X, VOC and PM emissions."[8] EPA intended this CAMx modeling "to provide additional information on visibility impacts and impairment and address possible concerns with utilizing CALPUFF to assess visibility impacts at Class I areas located far from these[s] emission sources."[9] Entergy agrees that CAMx modeling is necessary to assess the impairment (or lack thereof) caused by units located beyond CALPUFF's acceptable distance threshold, but EPA's CAMx modeling analysis is rendered unreliable by EPA's flawed modeling approach, as the MPE results indicate. Entergy continues to believe that the CAMx modeling presented in the November 2015 Submittal, which modeled annual actual emission rates and calculated estimated visibility impacts on the W20% visibility days, represents the most technically reliable analysis and indicates insignificant visibility impairment attributable to Entergy's BART-eligible units in Louisiana. Entergy's June 2016 Submittal also demonstrated that minimal impacts are expected from Entergy's BART-eligible units, even though a more conservative approach was used.

Entergy identified a number of specific concerns with EPA's CAMx modeling assessment, which include issues with the selected modeling methodology and the results of the MPE. EPA addresses these specific concerns individually in other response to comments.

p **W**Cleco and Entergy assert that their BART-eligible sources were shown through their initial CAMx modeling analysis not to have significant impacts above the 0.5 dv threshold and are, therefore, not subject to BART. Even though the commenters disagreed with the technical basis of EPA's requests for revised modeling, revised modeling analyses were completed for these sources and the commenters maintain that based on their revised modeling analyses, these units are not subject to BART. Commenters state that the CAMx and CALPUFF modeling that support the rulemaking and determination that these sources are subject to BART

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[7] Proposed Rule at 22,945.
[8] CAMx Modeling TSD, at 5.
[9] Id. at 6.

contain significant defects, making the modeling far less reliable than the initial CAMx modeling analyses submitted by Cleco and Entergy. CAMx modeling is clearly superior to CALPUFF modeling when considering the relatively long distances between the modeled source and the Class I areas. The commenters state that the CAMx modeling protocol followed in their initial modeling analysis was proper, minimizes potential bias and shows that the BART-eligible units at Cleco Brame Energy Center units and Entergy Nelson, Waterford, Willow Glen, Ninemile Point, and Little Gypsy have insignificant impacts to any Class I area. Therefore, the commenters believe all of these units should have been characterized as not subject to BART by LDEQ and EPA.

The commenters state that EPA should reconsider its evaluation of the submitted CAMx modeling, as the EPA's concerns about the accuracy of these modeling results are unfounded. Commenters provide additional specific comments addressing technical issues related to EPA's assessment of Cleco and Entergy's CAMx modeling analyses, refutes EPA's criticism in the proposed rule and TSD of this modeling, as well as comments concerning problems with EPA's own CAMx modeling methodology and performance evaluation. These specific comments also address deficiencies with the CALPUFF modeling system, including limitations on modeling at distances greater than 300km and the ability of the CALPUFF model to assess visibility impacts.

o WWe disagree with the comments, and we agree with LDEQ that the CALPUFF modeling following the reviewed protocol is an appropriate tool for evaluating visibility impacts and benefits to inform a BART determination. Relying on the CALPUFF modeling results submitted by Cleco[10] and Entergy,[11] as well as EPA's review and additional CALPUFF modeling,[12] included in the February 2017 and October 2017 SIP revisions, LDEQ concluded that the BART-eligible sources at Cleco Brame Energy Center and the Entergy Nelson, Waterford, Willow Glen, Ninemile Point, and Little Gypsy facilities have visibility impacts greater than 0.5 dv and are therefore subject to BART. We are finalizing our approval of LDEQ's subject to BART determinations for these EGU sources. Accordingly, LDEQ performed the required five-factor analyses and made BART determinations for these subject to BART sources. We agree with the commenters that CAMx provides a scientifically defendable platform for assessment of visibility impacts over a wide range of source to receptor distances and is also more suited than some other modeling approaches for evaluating the impacts of SO_2, NOx, VOC and PM emissions as it has a more robust chemistry mechanism. As we discuss below, we utilized CAMx to provide additional data and analysis for some large emission sources. However, CALPUFF is an appropriate tool for BART evaluations and remains the recommended

[10] CALPUFF Modeling Report BART Applicability Screening Analysis: Cleco Corporation, Brame Energy Center, Teche Power Station, Prepared by Trinity Consultants, July 30, 2015. Available in Appendix B of the 2017 Louisiana Regional Haze SIP submittal.
[11] Updated BART Applicability Screening Analysis Prepared by Trinity Consultants, November 9, 2015. Available in Appendix D of the 2017 Louisiana Regional Haze SIP submittal.
[12] DRAFT Technical Support Document for Louisiana Regional Haze: CALPUFF Best Available Retrofit Technology Modeling Review, April 2017 (revised May 2017 to include Entergy Nelson) Available in Appendix F of the 2017 Louisiana Regional Haze SIP submittal. EPA performed additional modeling for Entergy Nelson to address identified errors in some emission estimates.

model for BART.[13] We are confident that CALPUFF distinguishes the relative contributions from sources such that the differences in source configurations, sizes, emission rates, and visibility impacts are well-reflected in the model results. We address specific comments concerning limitations on modeling distance and the ability of CALPUFF to assess visibility impacts from these sources in detail elsewhere in this document. We note that Entergy Waterford, Willow Glen, Ninemile Point, and Little Gypsy are located 217 km or less from the nearest Class I area. Therefore, the commenters concern regarding the use of CALPUFF modeling for distances greater than 300km are not relevant to the subject to BART determinations made for these sources.

As we noted in our May 19, 2017 proposed action and CALPUFF Modeling TSD[14], the CALPUFF model is typically used for distances less than 300-400 km. Some of the BART-eligible sources in Louisiana are far away from a Class I area yet have high enough emissions that they may significantly impact visibility at Class I areas in Louisiana and surrounding states. We performed additional modeling using CAMx to evaluate the visibility impacts and benefits of controls for the Entergy Nelson, Cleco Brame, and Big Cajun II sources to address possible concerns with utilizing CALPUFF to assess visibility impacts at Class I areas located far from these large emission sources. LDEQ included this modeling in Appendix F of the October 26, 2017 SIP revision.[15] Our CAMx modeling supports the determination made by LDEQ that Entergy Nelson and Cleco Brame, cause or contribute to visibility impairment at nearby Class I areas and are subject to BART. Entergy Nelson has a maximum modeled impact of 2.22 dv at Caney Creek, with 31 days out of the 365 days modeled exceeding 0.5 dv, and 9 days exceeding 1.0 dv. Similarly, Cleco Brame has a maximum modeled impact of 2.833 dv at Caney Creek, with 30 days out of a maximum 365 days modeled exceeding 0.5 dv and 10 days exceeding 1.0 dv. We disagree with the commenters and find that our CAMx modeling is consistent with the BART Guidelines and a previous modeling protocol we developed for the use of CAMx modeling for BART screening for sources in Texas.[16,17] We respond to specific comments

[13] 82 FR 5182, 5196 (Jan. 17, 2017). "As detailed in the preamble of the proposed rule, it is important to note that the EPA's final action to remove CALPUFF as a preferred appendix A model in this *Guideline* does not affect its use under the FLM's guidance regarding AQRV assessments (FLAG 2010) nor any previous use of this model as part of regulatory modeling applications required under the CAA. Similarly, this final action does not affect the EPA's recommendation [See 70 FR 39104, 39122-23 (July 6, 2005)] that states use CALPUFF to determine the applicability and level of best available retrofit technology in regional haze implementation plans."
[14] 82 FR 32294 (May 19, 2017).
[15] DRAFT Technical Support Document for Louisiana Regional Haze: CAMx Best Available Retrofit Technology Modeling April 2017 (Revised May 2017 to include Entergy Nelson) Available in Appendix F of the 2017 Louisiana Regional Haze SIP submittal.
[16] Texas had over 120 BART-eligible facilities located at a wide range of distances to the nearest class I areas in their original Regional Haze SIP. Due to the distances between sources and Class I areas and the number of sources, Texas worked with EPA and FLM representatives to develop a modeling protocol to conduct BART screening of sources using CAMx photochemical modeling. Texas was the only state that screened sources using CAMx and had a protocol developed for how the modeling was to be performed and what metrics had to be evaluated for determining if a source screened out. See Guidance for the Application of the CAMx Hybrid Photochemical Grid Model to Assess Visibility Impacts of Texas BART Sources at Class I Areas, ENVIRON International, December 13, 2007, available in the docket for this action.
[17] EPA, the Texas Commission on Environmental Quality (TCEQ), and FLM representatives verbally approved the approach in 2006 and in email exchange with TCEQ representatives in February 2007 (see email from Erik Snyder

concerning our CAMx modeling, including model inputs, model performance, our modeling protocol and the use of direct model results in detail in this Modeling RTC document.

As we discuss in detail in our May 19, 2017 proposed action and CAMx Modeling TSD,[18], the initial CAMx modeling, as well as the revised modeling submitted by Cleco and Entergy[19] was not conducted in accordance with the BART Guidelines and a previous modeling protocol developed for the use of CAMx modeling for BART screening (EPA, Texas and FLM representatives approved), [20,21] and does not properly assess the maximum baseline impacts. We disagree with the commenters and consider this submitted CAMx modeling to be invalid for supporting any determination of visibility impacts below 0.5 dv. We respond to specific comments concerning the submitted CAMx modeling analyses in detail elsewhere in this document.

LDEQ stated that they did not reject Entergy's CAMx modeling for the reasons stated by EPA in our preamble. LDEQ indicated that LDEQ did not have the expertise required to review the CAMx modeling submitted by EPA or Entergy. LDEQ stated that it did not adopt the CAMx modeling provided by EPA and that it conducted its own five-factor analysis for the Nelson facility.

o LDEQ relied solely on CALPUFF modeling submitted to LDEQ by EPA and Entergy.[22] EPA recognizes that LDEQ conducted its own review of the information submitted to it by EPA and Entergy and reached its final determination independently. As stated in several responses in the accompanying federal register notice, EPA considers the final SIP document as well as any accompanying supporting documents or appendices that have been submitted by the State. In our review of the LA RH SIP, we reviewed the CALPUFF modeling and CAMx

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(EPA) to Greg Nudd of TCEQ Feb. 13, 2007 and response email from Greg Nudd to Erik Snyder Feb. 15, 2007, available in the docket for this action).

[18] 82 FR 32294, (May 19, 2017).

[19] February 10, 2017 LA RH SIP, Appendices B (Cleco) and D (Entergy).

[20] Texas had over 120 BART-eligible facilities located at a wide range of distances to the nearest class I areas in their original Regional Haze SIP. Due to the distances between sources and Class I areas and the number of sources, Texas worked with EPA and FLM representatives to develop a modeling protocol to conduct BART screening of sources using CAMx photochemical modeling. Texas was the only state that screened sources using CAMx and had a protocol developed for how the modeling was to be performed and what metrics had to be evaluated for determining if a source screened out. See Guidance for the Application of the CAMx Hybrid Photochemical Grid Model to Assess Visibility Impacts of Texas BART Sources at Class I Areas, ENVIRON International, December 13, 2007, available in the docket for this action.

[21] EPA, the Texas Commission on Environmental Quality (TCEQ), and FLM representatives verbally approved the approach in 2006 and in email exchange with TCEQ representatives in February 2007 (see email from Erik Snyder (EPA) to Greg Nudd of TCEQ Feb. 13, 2007 and response email from Greg Nudd to Erik Snyder Feb. 15, 2007, available in the docket for this action).

[22] Updated BART Applicability Screening Analysis Prepared by Trinity Consultants, November 9, 2015. Available in Appendix D of the 2017 Louisiana Regional Haze SIP submittal, and DRAFT Technical Support Document for Louisiana Regional Haze: CALPUFF Best Available Retrofit Technology Modeling Review, April 2017 (revised May 2017 to include Entergy Nelson) Available in Appendix F of the 2017 Louisiana Regional Haze SIP submittal. EPA performed additional modeling for Entergy Nelson to address identified errors in some emission estimates.

modeling submitted by Entergy and Cleco, as well as considered the additional CALPUFF and CAMx modeling developed by EPA that was provided to LDEQ prior to SIP submittal and was included in the submitted SIP.

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WAs stated in LDEQ's SIP revision submittal, Cleco presented LDEQ with CAMx modeling as demonstration that Cleco's BART-eligible facilities have minimal visibility impact on Class I areas.[23] Cleco's initial modeling assessment submitted on January 14, 2016 (January 2016 Submittal) evaluated Cleco's BART-eligible sources with the maximum annual emission rates from the original baseline period of 2000-2004. Utilizing the same post-processing methodology for CAMx visibility assessments that was used in the CAMx modeling performed in support of the Oklahoma and Texas Regional Haze (Reasonable Progress) Federal Implementation Plan (FIP),[24] the impacts from Cleco's BART-eligible sources were found to be negligible. The maximum impacts during the worst 20% visibility days from Brame Unit 2 were 0.013 dv at the Breton Wilderness Area (Breton) and 0.008 dv at the Caney Creek Wilderness Area (Caney Creek), thereby supporting the conclusion that Cleco's facilities contribute only very minimally to visibility impairment at Class I areas.[25]

WAlthough CAMx modeling is absolutely necessary to assess the impacts of units outside CALPUFF's allowable range, EPA's CAMx-based BART assessment is rendered defective by EPA's modeling methodology and analysis of impacts, as evidenced by the MPE results. Cleco's continued position is that the CAMx modeling included in Cleco's January 2016 Submittal provides the most accurate representation of the real contributions toward visibility impairment by Cleco's BART-eligible sources on the W20% visibility days. The June 2016 Submittal, which uses modeled emissions representative of the maximum 24-hour rates and follows a modified version of EPA's post-processing methodology, also indicates the minimal expected impacts of Cleco's BART-eligible sources despite the overly conservative nature of the approach.

WIn its November 2015 Submittal, Entergy included an initial CAMx modeling assessment for its BART-eligible sources as part of its BART screening analysis. This modeling utilized maximum annual emission rates from the original baseline period of 2000-2004, and evaluated impacts using the post-processing methodology for CAMx visibility assessments that was employed in the modeling performed for EPA's Oklahoma and Texas Regional Haze FIP.[26] The results presented in Entergy's November 2015 Submittal demonstrate that Nelson contributes only minimally to visibility impairment at Class I areas: the maximum impacts from Nelson during the worst 20% ("W20%") visibility days was 0.0192 dv at Caney Creek and

[23] SIP Revision Submittal, p. 10.
[24] EPA, Technical Support Document for the Oklahoma and Texas Regional Haze Federal Implementation Plans (Nov. 2014), Docket No. EPA-R06-OAR-2014-0754-0007 (Texas Reasonable Progress FIP TSD).
[25] January 2016 Submittal, p. 1-1.
[26] EPA, Technical Support Document for the Oklahoma and Texas Regional Haze Federal Implementation Plans (Nov. 2014), Docket No. EPA-R06-OAR-2014-0754-0007 (Texas Reasonable Progress FIP TSD).

0.0116 dv at Breton.[27] Even updating the CAMx modeling to comport with certain changes requested by EPA did not appreciably change the results.[28] The updated modeling showed that the maximum impacts from Nelson during the W20% visibility days were 0.3367 dv at Caney Creek and 0.1350 dv at Breton.[29]

As Entergy has stated in its previous submittals, its November 2015 Submittal presents the most technically reliable results for evaluating Entergy's BART-eligible units, including Nelson.[30] Based on Entergy's November 2015 Submittal, the Nelson BART-eligible units should not be considered subject to BART

o WAs stated in the Louisiana RH SIP regarding the Nelson units, "LDEQ has not used the CAMx modeling to ascertain that the units have satisfied the BART requirements." [31] LDEQ relied solely on CALPUFF modeling submitted to LDEQ by EPA and Entergy. In our review of the LA RH SIP, we reviewed the CALPUFF modeling and CAMx modeling submitted by Entergy and Cleco, and we considered the additional CALPUFF and CAMx modeling developed by EPA that was provided to LDEQ and included in Appendix F as part of LDEQ's SIP submittal.

We disagree with the commenter and find Entergy and Cleco's CAMx modeling does not properly assess the maximum baseline impacts and is inconsistent with the BART Guidelines. We consider this submitted CAMx modeling to be invalid for supporting any determination of visibility impacts below 0.5 dv. BART modeling is focused on identifying the maximum potential impact from the source by modeling steady-state maximum actual emissions over a range of meteorological conditions. Maximum daily impacts are assessed by examining model results on all modeled days. As discussed in the CAMx Modeling TSD[32] and in our Preliminary Review Response letter to Entergy and Cleco, the initial modeling deviated from the BART guidelines because it did not utilize emissions representative of maximum 24-hr actual emissions from the baseline period, did not evaluate the maximum modeled impact for all days, and did not calculate the deciview visibility impact based on a natural visibility background approach.

As we discuss in detail in the section below, this modeling's utilization of annual emissions is not appropriate as it does not reflect periods of high capacity utilization as required in the BART Guidelines. BART determinations for fossil-fuel fired power plants with a total generating capacity greater than 750 megawatts must be made pursuant to the BART Guidelines.[33] In the BART guidelines, we state that States should use the 24-hour average actual emission rate from

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[27] November 2015 Submittal, Tbls. 4-1 and 4-2.
[28] As thoroughly addressed in the 2016 CAMx Modeling Report, Entergy disagreed with the changes EPA requested, finding that they would render the modeling results unreliable. 2016 CAMx Modeling Report, at 5-1 ◌̇ 5-2.
[29] 2016 CAMx Modeling Report, Tbls. 6-1 and 6-2.
[30] 2016 CAMx Modeling Report, at 1-1.
[31] LA RH SIP Revision Addendum, June 19, 2017, p.5.
[32] Technical Support Document for EPA's Proposed Action on the Louisiana Regional Haze State Implementation Plan, April 2017 (Revised May 2017 and June 2017 to include Entergy Nelson).
[33] 40 CFR 51.308(e)(1)(ii)(B)

the highest emitting day of the meteorological period modeled, unless this rate reflects periods of start-up, shutdown, or malfunction. This emission rate is then used for the entire time period modeled.

This initial modeling analysis also fails to assess the maximum baseline impacts because it focused only on the modeled visibility impacts on the 20% worst days as defined by monitored data for 2002. Approximately 24 days of monitored data comprise the 20% worst days at each Class I area. [34] It is very likely that maximum impact from each BART source occurs on days not included in the small set of days (24 of 365 days or less than 7% of the days) that are included in the 20% worst monitored days. For example, the 20% worst days at Caney Creek represent days with significant impacts from Northeast Texas or the Eastern U.S. These days do not have meteorological conditions that would result in significant transport from Louisiana EGU BART sources. Limiting the evaluation to impacts that occur only on this small subset of days ignores impacts on days with meteorological conditions most likely to result in visibility impairment from the sources in Louisiana. Furthermore, as discussed in detail elsewhere, in assessing the maximum visibility impacts from a source, direct model results should be evaluated rather than post-processing the results using relative response factors (RRFs). This initial modeling utilized a RRF approach and considered only the average model response across the 20% worst days and the monitored data for those days.

Finally, the deciview impact for each day should be calculated based on a natural visibility background approach. The BART Guidelines state: "You should calculate daily visibility values for each receptor as the change in deciviews compared against natural visibility conditions." The initial modeling analysis did not follow this approach and instead used dirty background conditions to calculate the visibility impairment. As explained in the preamble to the final Regional Haze Rule and Guidelines for BART Determinations, using a metric that is dependent on current degraded background visibility conditions results in a paradox that the dirtier the existing air, the smaller an individual source's visibility impact will become.[35] In other words, as visibility conditions worsen at a Class I area, the visibility impact from a source would appear to be smaller and controls would be less likely. Therefore, to fully assess the potential visibility impacts and benefits of controls at a source, deciview impacts based on natural "clean" background conditions should be considered.

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[34] 20% worst visibility days are identified by 2002 monitored data at each Class I area. Monitor data is available on every third day.

[35] Using existing conditions as the baseline for single source visibility impact determinations would create the following paradox: the dirtier the existing air, the less likely it would be that any control is required. This is true because of the nonlinear nature of visibility impairment. In other words, as a Class I area becomes more polluted, any individual source's contribution to changes in impairment becomes geometrically less. Therefore, the more polluted the Class I area would become, the less control would seem to be needed from an individual source. We agree that this kind of calculation would essentially raise the "cause or contribute" applicability threshold to a level that would never allow enough emission control to significantly improve visibility. Such a reading would render the visibility provisions meaningless, as EPA and the States would be prevented from assuring "reasonable progress" and fulfilling the statutorily-defined goals of the visibility program. Conversely, measuring improvement against clean conditions would ensure reasonable progress toward those clean conditions. 70 FR 39124

After our initial review of Entergy and Cleco's initial CAMx modeling[36] provided to us before LDEQ proposed its SIP, we provided additional guidance to LDEQ and Entergy/Cleco/Trinity Consultants and also provided the CAMx modeling protocol developed in 2006/2007 by TCEQ and agreed upon by Region 6, FLMs and OAQPS for BART sources in Texas[37],[38] as an example of an approved protocol utilizing CAMx modeling for BART screening. Our guidance that we provided to LDEQ, the source owners, and Trinity Consultants is consistent with the BART Guidelines and is summarized below:

- Use emissions representative of actual 24-hr maximum emissions from the baseline period
- Evaluate the maximum impact for all modeled days, not just the 20% worst monitored days
- Calculation of deciview impact based on natural background visibility conditions
- Analyze direct model results of the baseline modeling

In response to this guidance, Entergy and Cleco revised their CAMx model analyses[39] and provided updated model results along with their critique of EPA's guidance to LDEQ and EPA. A description of this revised modeling and a summary of model results is provided in the February 2017 Louisiana Regional Haze SIP submittal. The general approach followed by Trinity Consultants on behalf of Entergy and Cleco for this revised modeling is they used twice the annual emission rate as an estimate of maximum emissions, calculated deciview impact based on natural background visibility conditions, and continued to use an RRF approach rather than direct model results but altered the approach by developing RRF values for the 20% best and 20% worst days, averaging them, and then applied these RRF values to all monitored days throughout the year. Since the monitoring frequency is only 1 in 3 days, only focusing on monitored days also underestimates the maximum impacts. In the sections below, we respond to specific comments regarding the revised Cleco and Entergy modeling. We also review this revised modeling in detail in the CAMx Modeling TSD, identify a number of shortcomings in

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[36] See Updated BART Applicability Screening Analysis Prepared by Trinity Consultants, November 9, 2015. Available in Appendix D of the 2017 Louisiana Regional Haze SIP

[37] Texas had over 120 BART-eligible facilities located at a wide range of distances to the nearest class I areas in their original Regional Haze SIP. Due to the distances between sources and Class I areas and the number of sources, Texas worked with EPA and FLM representatives to develop a modeling protocol to conduct BART screening of sources using CAMx photochemical modeling. Texas was the only state that screened sources using CAMx and had a protocol developed for how the modeling was to be performed and what metrics had to be evaluated for determining if a source screened out. See Guidance for the Application of the CAMx Hybrid Photochemical Grid Model to Assess Visibility Impacts of Texas BART Sources at Class I Areas, ENVIRON International, December 13, 2007, available in the docket for this action.

[38] EPA, the Texas Commission on Environmental Quality (TCEQ), and FLM representatives verbally approved the approach in 2006 and in email exchange with TCEQ representatives in February 2007 (see email from Erik Snyder (EPA) to Greg Nudd of TCEQ Feb. 13, 2007 and response email from Greg Nudd to Erik Snyder Feb. 15, 2007, available in the docket for this action).

[39] See October 10, 2016 Letter from Cleco Corporation to Vivian Aucoin and Vennetta Hayes, LDEQ, RE: Cleco Corporation Louisiana BART CAMx Modeling, included in Appendix B of the 2017 Louisiana Regional Haze SIP submittal; CAMx Modeling Report, prepared for Entergy Services by Trinity Consultants, Inc. and All 4 Inc, October 14, 2016, included in Appendix D of the 2017 Louisiana Regional Haze SIP submittal

their revised approach, and conclude that it does not properly assess the maximum baseline impacts and is inconsistent with the BART Guidelines.

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(b)WEPA's request to use maximum 24-hour emission rates is inappropriate in the context of a CAMx modeling assessment. As discussed in the CAMx Modeling TSD, Entergy's June 2016 Submittal contained modeling that "utilized 2 times the 2002 actual annual emission rate as 'representative estimates of the maximum 24-hr emissions,'" instead of using continuous emission monitoring (CEM) data to identify actual maximum 24-hour emissions during the baseline period.[40] EPA maintains that use of maximum 24-hour emission rates is a required element of a BART assessment; however, as Entergy explained in the 2016 CAMx Modeling Report, the BART Guidelines "recommend," but do not require, use of maximum 24-hour steady-state emissions.[41]

Modeling capabilities for performing visibility assessments at the time the BART Guidelines were issued were limited primarily to CALPUFF, which was then the best long-range transport model available that was capable of performing single-source assessments.[42] The BART Guidelines were, therefore, not developed with consideration of photochemical grid models (e.g., CAMx) but were instead based on the overly-simplistic CALPUFF modeling system's abilities. Since the time that the BART Guidelines were developed, over 12 years ago, CALPUFF has been removed as an EPA-preferred model for long-range transport assessments,[43] which indicates it is no longer the best single-source modeling application. Although EPA's removal of CALPUFF as a preferred model does not affect EPA's recommendation that states use CALPUFF to determine the applicability and level of BART,[44] this is an insufficient rationale for continuing to use a model that is outdated and has been demonstrated to overstate predicted impacts. The more rigorous chemistry mechanism and an ability to model complete emissions inventories make CAMx far better-suited to estimate a "maximum daily visibility value" as required by the BART Guidelines.[45] Arbitrarily applying the outdated BART procedures to CAMx modeling assessments is unreasonable and likely to result in mischaracterization of predicted visibility values.

Because representing sources at maximum emission rates during every modeled day is likely to skew the CAMx model's ability to accurately simulate impacts, Entergy's continued position is that the modeled impacts included in the November 2015 Submittal—based on actual annual

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[40] CAMx Modeling TSD, at 29.
[41] Guidelines for BART Determinations Under the Regional Haze Rule, 40 C.F.R. pt. 51, App. Y Section III.A.3.2
[42] Final Rule, Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations, 70 Fed. Reg. 39,104, 39,122 (July 6, 2005) (BART Guidelines).
[43] Final Rule, Revisions to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches To Address Ozone and Fine Particulate Matter, 82 Fed. Reg. 5,182, 5,194 (Jan. 17, 2017).
[44] Id. at 5,196.
[45] BART Guidelines, 70 Fed. Reg. at 39,121.

emissions—best characterize visibility impacts from Entergy's BART-eligible sources in Louisiana.

However, because EPA's discussion in the CAMx Modeling TSD focuses on Entergy's June 2016 Submittal (rather than the November 2015 Submittal), EPA should be aware that the doubled annual emission rates used in the June 2016 Submittal for Entergy's Nelson Unit 6 are similar to the maximum 24-hour emission rates used in EPA's CAMx Modeling, as demonstrated in Table 1 below. Therefore, EPA should not disregard Entergy's modeling purely on the basis of its modeled emission rates.

Table 1. Comparison of EPA and Trinity's Modeled CAMx Emission Rates

Scenario and Emissions Basis	CAMx Modeled Emission Rates (tpy)					
	SO_2	NO_X	PM_{10}	VOC	CO	$PM_{2.5}$
Entergy's CAMx Modeling (2x Annual)	37,702.84	12,274.80	962.59	82.00	703.00	721.94
EPA's CAMx Modeling (Maximum 24-Hr)	32,601.80	25,520.80[1]	1,513.37	82.00	703.00	1,141.37

[1] The NO_X emission rate that EPA utilized in its modeling is an outlier value and should have been removed from consideration, as EPA did for other sources (*see* Section III.A.3). The NO_X emission rate that should have been used is 15,018.66 tons per year (tpy), representing the highest non-outlier daily NO_X emission rate.

( )WEPA notes in the CAMx Modeling TSD that the modeling in Cleco's June 2016 Submittal "utilized 2 times the 2002 actual annual emission rate as 'representative estimates of the maximum 24-hr emissions,'" as opposed to using continuous emission monitoring (CEM) data to identify actual maximum 24-hour emissions during the baseline period.[46] As noted in the Cleco Response Letter, however, the BART Guidelines merely "recommend" and do not require the use of a maximum 24-hour steady-state emission rate.[47] Since the BART Guidelines were not developed with photochemical grid models like CAMx in mind, but rather were written based on the capabilities of CALPUFF, it is unreasonable to indiscriminately apply these dated procedures to CAMx modeling assessments.

The BART Guidelines were developed at a time when CALPUFF was the best available tool for estimating visibility impairment. In the twelve years that have passed since the issuance of the BART Guidelines, however, CALPUFF has been removed as an EPA-preferred model for long-range transport assessments,[48] signaling that it is no longer the best application available for single-source modeling. CAMx, which has a substantially more robust chemistry mechanism and can account for a complete emissions inventory, is better suited to represent modeled impacts within a specific time frame. Therefore, in the case of using CAMx, the goal of estimating a

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[46] CAMx Modeling TSD, p. 29.
[47] 40 C.F.R. part 51 Appendix Y Section III.A.3.2
[48] Final Rule, Revisions to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches To Address Ozone and Fine Particulate Matter, 82 Fed. Reg. 5,194 (Jan. 17, 2017).

realistic "maximum daily visibility value" as required by the BART Guidelines may be better served by evaluating individual units with more realistic emission rates. Blanket use of maximum emission rates is likely to create a bias against BART-eligible sources, skewing the CAMx model's superior predictive capabilities and thereby diminishing the benefits of using the more robust tool.

Therefore, as discussed in the Cleco Response Letter, Cleco's position continues to be that the results presented in the January 2016 Submittal, which utilized actual annual emission rates, provides the best indication of potential visibility impacts. Because Cleco's June 2016 Submittal is the subject of EPA's discussion in the CAMx Modeling TSD, though, it is important to note that the emission rates based on doubled annual values are substantially similar to the maximum 24-hour emission rates utilized by EPA, as demonstrated in Table 2-1. Thus, Cleco's modeling should not be disregarded on the basis of its modeled emission rates alone.

Table 2-1. Comparison of EPA and Trinity's Modeled CAMx Emission Rates

Scenario and Emissions Basis	CAMx Modeled Emission Rates (tpy)					
	SO2	NOX	PM10	VOC	CO	PM2.5
Cleco's CAMx Modeling (2x Annual)	27,441.14	12,405.72	1,660.90	55.00	455.00	1,660.90
EPA's CAMx Modeling (Maximum 24-Hr)	23,717.70	14,446.70	641.03	55.00	455.00	193.03

WCAMx is a full-chemistry, multi-source modeling system that is better able to characterize visibility than CALPUFF. As such, use of a steady-state maximum 24-hour emission rate to evaluate BART-eligible sources on the basis that such emissions were used with CALPUFF is inappropriate, as explained in Entergy's past submittals.[49]

o WWe disagree with the comments. As discussed in the CAMx Modeling TSD, BART Modeling is focused on identifying the maximum potential impact from the source by modeling steady-state maximum actual emissions over a range of meteorological conditions. Maximum daily impacts are assessed by examining model results on all modeled days.

The BART Guidelines state:

> "The emissions estimates used in the models are intended to reflect steady-state operating conditions during periods of high capacity utilization. We do not generally recommend that emissions reflecting periods of start-up, shutdown, and malfunction be used, as such emission rates could produce higher than normal effects than would be typical of most facilities. We recommend that States use the 24-hour average actual emission rate from the highest emitting day of the meteorological period modeled, unless this rate reflects periods start-up, shutdown, or malfunction."

[49] 2016 CAMx Modeling Report, at 5-1; and April 2017 Letter, at 6.

The use of annual emissions, as suggested by the commenter, is not appropriate as it does not reflect periods of high capacity utilization as called for in the BART Guidelines. BART determinations for fossil-fuel fired power plants with a total generating capacity greater than 750 megawatts must be made pursuant to the BART Guidelines.[50]

We disagree with the commenter that the recommendation in the BART guidelines that the 24-hour average actual emission rate from the highest emitting day is specific to the use of the CALPUFF model. The BART Guidelines specifically contemplate the use of other appropriate models[51] and state that "The emissions estimates used in the models are intended to reflect steady-state operating conditions during periods of high capacity utilization." The use of the plural term "models" indicates that this applies regardless of which model is selected. The requirement to use the emissions estimates that reflect steady-state operating conditions during periods of high capacity utilization stems from the goal of the subject to BART analysis to assess the maximum potential impact by modeling steady-state maximum actual emissions over a range of meteorological conditions. The use of average or annual emissions in either CALPUFF or CAMx would only serve to assess the average visibility impact and not the impact during periods of high capacity utilization.

We note that in response to our review of their initial modeling, Cleco and Entergy revised their modeling and, among other revisions, utilized double the annual emission rate. As can be seen by the data provided in the comments on modeled emission rates, Entergy Nelson and Cleco Brame modeled emission rates for SO_2 are higher than the recorded actual 24-hr maximum emission rate from the baseline. The opposite is true for modeled NOx emission rates. As discussed in the CAMx Modeling TSD, the use of 2 times the annual emission rate may over or under estimate the 24-hr maximum actual emissions from coal-fired EGUs. For the Entergy BART-eligible gas-fired units that occasionally burn fuel oil, 2 times annual emission rate severely underestimates the maximum 24-hr emissions and results in an underestimate of the maximum modeled impacts.[52] Because CEM data is available for all of these sources, there is no need to use estimates of the maximum emissions, as actual monitored data is available. In fact, this CEM data was used by Entergy and Cleco to identify emission rates utilized in CALPUFF modeling performed by Trinity Consultants for the Entergy and Cleco sources and submitted to LDEQ. We note that for Texas non-EGU BART modeling as described in the Texas BART modeling protocol, no CEM data was available and therefore an estimate, such as using twice the annual emission rate was necessary. Similarly, because CEM data is not available for PM emissions, estimates of maximum emissions are necessary.

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[50] 40 CFR 51.308(e)(1)(ii)(B)

[51] "You can use CALPUFF or other appropriate model to predict the visibility impacts from a single source at a Class I area." 40 CFR Appendix Y, Section III. HOW TO IDENTIFY SOURCES ''SUBJECT TO BART''

[52] See Table 4.1-1 of the CAMx Modeling TSD. In the case of Waterford Unit 2, maximum 24-hr emission rate is over 6000 times larger than the annual emissions rate.

: EPA contends that the CAMx modeling submitted by Cleco in the June 2016 Submittal followed a post-processing approach that deviates from the BART Guidelines and the previously approved Texas BART CAMx modeling protocol[53] by using RRFs paired with actual monitor data (gathered by the Interagency Monitoring of Protected Visual Environments—IMPROVE workgroup) as opposed to direct model output.

First, as discussed in Section 2.1, the BART Guidelines were developed with CALPUFF technology in mind, and methods appropriate for CALPUFF may not be appropriate for CAMx. Additionally, the previously approved Texas BART Screening CAMx Modeling Protocol (Texas BART Protocol) is not binding and does not automatically apply to every situation without full consideration of all relevant circumstances.

Moreover, as discussed in the Cleco Response Letter[54] and stated by EPA in previous actions (e.g., Texas and Oklahoma Reasonable Progress FIP—*see* Response to Comments [RTC] document), EPA indicated that despite its well-documented superiority over CALPUFF, CAMx still had potential for model bias, which could be ameliorated by tethering model data to monitor data.[55] In other words:
1. CAMx may be subject to some modeling bias concerns; and,
2. Using RRFs can be a useful method for minimizing the influence of this modeling bias.

However, in EPA's most recent CAMx modeling for Louisiana and Texas, this concern is completely disregarded despite a relatively poor model performance evaluation (MPE). Furthermore, EPA opted to utilize the absolute maximum impacts in its evaluation, which allows model bias to play a significant role in establishing individual source baseline visibility impacts (e.g., if the model inadvertently over-predicts individual source impacts on one day of the modeled year by a significant margin, EPA would select *that* over-predicted value to represent the source). Therefore, with EPA's direct-modeled absolute maximum post-processing methodology, there is an acknowledged, substantial risk for unrealistic and overstated modeled visibility impacts to lead to costly regulatory decisions. Therefore, Cleco's continued position is that EPA's methods are inappropriate and unreliable, and that RRFs *must* be used to mitigate modeling bias.

WAlthough CAMx is a technically superior model, it is still subject to concerns of modeling bias (as are all models). As such, it is inappropriate to rely on modeled concentrations directly output by the model, and RRFs should be utilized along with IMPROVE monitor data to "help remove potential bias concerns."[56] EPA's modeling results are rendered unreliable by

[53] Environ International Corporation, Revised Draft Final Modeling Protocol: Screening Analysis of Potentially BART-Eligible Sources in Texas (Sept. 27, 2006). Docket No. EPA-R06-OAR-2017-0129-0012.
[54] Cleco Response Letter, p. 10.
[55] EPA, Response to Comments for the Federal Register Notice for the Texas and Oklahoma Regional Haze State Implementation Plans; Interstate Visibility Transport State Implementation Plan to Address Pollution Affecting Visibility and Regional Haze; and Federal Implementation Plan for Regional Haze, pp. 563-564, 566, 569, 585 (Dec. 9, 2015). Docket No. EPA-R06-OAR-2014-0754-0087 (Texas and Oklahoma RTC).
[56] Texas and Oklahoma RTC, p. 585.

EPA's disregard for potential modeling bias and cannot be used to finalize costly BART determinations.

WEPA's determination that CAMx outputs should be evaluated directly defies precedent and prevents amelioration of modeling bias. EPA's CAMx Modeling TSD states that Entergy's June 2016 CAMx modeling—which used RRFs paired with actual monitor data (gathered by the Interagency Monitoring of Protected Visual Environments (IMPROVE) workgroup) to assess visibility impacts—followed a post-processing methodology that is inconsistent with the previously approved Texas BART Screening CAMx Modeling Protocol (Texas BART Protocol) and the BART Guidelines.[57] The Texas BART Protocol is not a binding document and should not automatically be applied in every scenario without considering all relevant circumstances. Further, because the BART Guidelines were originally developed assuming the use of the CALPUFF modeling system, the procedures described in the BART Guidelines may not automatically be appropriate for a CAMx analysis, even if they were appropriate for CALPUFF.

As described fully in Entergy's various responses to EPA's CAMx modeling reviews, the CAMx modeling system, although far superior to CALPUFF, still has potential for modeling bias. EPA stated as much in the Texas Reasonable Progress FIP Response to Comments (Texas Reasonable Progress FIP RTC): (1) CAMx modeling is subject to concerns of modeling bias, and (2) the use of RRFs can reduce the impacts of this modeling bias.[58]

In EPA's CAMx modeling for Louisiana and Texas, EPA ignores its own concerns about modeling bias. Given the relatively poor performance of the model, as demonstrated by the Model Performance Evaluation (MPE), EPA's disregard for potential modeling bias is suspect. And yet, EPA insists in this action that it is still appropriate to evaluate modeled sources based on the absolute maximum, direct-modeled impacts—a metric that provides the highest opportunity for modeling bias to influence regulatory decisions. For example, in the event that CAMx predicts source impacts well outside what might be expected in reality (i.e., an outlier), EPA's approach would select that over-predicted value to characterize visibility impacts from the source.

RRFs are of critical importance in properly evaluating CAMx modeling outputs so that modeling bias is ameliorated. EPA's proposed approach relies too heavily on direct CAMx output values, which are shown by the MPE to be at risk of being unrealistic and overstated. In light of the substantial potential costs to facilities associated with BART determinations, it is thoroughly inappropriate to depend on an approach that disregards known biases.

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[57] Environ International Corporation, Revised Draft Final Modeling Protocol: Screening Analysis of Potentially BART-Eligible Sources in Texas (Sept. 27, 2006). Docket No. EPA-R06-OAR-2017-0129-0012-07.
[58] EPA, Response to Comments for the Federal Register Notice for the Texas and Oklahoma Regional Haze State Implementation Plans; Interstate Visibility Transport State Implementation Plan to Address Pollution Affecting Visibility and Regional Haze; and Federal Implementation Plan for Regional Haze, pp. 563-564, 566, 569, 585 (Dec. 9, 2015). Docket No. EPA-R06-OAR-2014-0754-0087 (Texas Reasonable Progress FIP RTC).

WEPA has noted in other rulemakings that, regardless of CAMx's technical superiority, there remain concerns that modeling bias can inappropriately influence estimated visibility impacts (a concern with all models).[59] Therefore, RRFs should be used in conjunction with IMPROVE monitor data to "help remove potential bias concerns."[60] EPA's modeling conclusions are unreliable in this rulemaking, however, due to the Agency's reliance on absolute maximum modeled concentrations directly output by the model. The lack of evaluation of the potential effects of modeling bias is suspect, and until EPA remedies its post-processing methodology, the results of EPA's CAMx modeling cannot be used to finalize BART determinations that will impose significant costs on sources.

EPA should refer to Entergy's previous submittals for additional discussion regarding flaws with EPA's post-processing approach and the improvements offered through the use of RRFs.[61]

o WWe disagree with the comments. The previously approved Texas BART Screening CAMx Modeling Protocol (Texas BART Protocol)[62] utilized the maximum direct modeled impacts to screen non-EGU BART sources in Texas. We approved this analysis and subject to BART determinations.[63] We agree with the commenter that the Texas protocol is not binding for Louisiana sources, however, this protocol was developed by TCEQ, EPA and the FLMs to be consistent with the BART guidelines, modeling guidance and other relevant guidance, and in consideration of the capabilities of the photochemical model. The commenters state that the Texas protocol should not automatically be applied in every scenario without considering all relevant circumstances. However, the commenters provide no discussion or evidence of any unique or distinguishing circumstances that would support their claim that the approach followed in the Texas protocol is not appropriate for sources in Louisiana. In fact, we utilized the same model run and post-processing to evaluate visibility impacts of both Texas and Louisiana sources in our proposed BART actions for sources in those states.

Fine particle precursors react in the atmosphere to form $PM_{2.5}$, which impairs visibility by scattering and absorbing light. Our guidance presents appropriate approaches for assessing secondary particulate matter ($PM_{2.5}$) impacts from single sources. [64] Here we state:

> 'Based on the current capabilities of photochemical grid models and consistent with the NACAA Workgroup report[65], the EPA recommends the following approaches be

[59] Texas and Oklahoma FIP RTC, at 585.
[60] Id.
[61] 2016 CAMx Modeling Report, at 5-2; and April 2017 Letter, at 7-9.
[62] Environ International Corporation, Revised Draft Final Modeling Protocol: Screening Analysis of Potentially BART-Eligible Sources in Texas (Sept. 27, 2006). Docket No. EPA-R06-OAR-2017-0129-0012-07.
[63] 79 FR 74818 (Dec. 16, 2014), 81 FR 296 (Jan. 5, 2016).
[64] Guidance for $PM_{2.5}$ Permit Modeling, EPA-454/B-14-001; May 2014. See 'Section III.2.3 Full Quantitative Photochemical Grid Modeling.'
[65] NACAA, 2011: PM2.5 Modeling Implementation for Projects Subject to National Ambient Air Quality Demonstration Requirements Pursuant to New Source Review. Report from NACAA PM2.5 Modeling Implementation Workgroup dated January 7, 2011. Washington, District of Columbia 20001. http://www.epa.gov/ttn/scram/10thmodconf/review_material/01072011-NACAAPM2.5ModelingWorkgroupReport-FINAL.pdf

considered to estimate secondary $PM_{2.5}$ impacts from a proposed new or modifying source using this type of model:

- "Brute force zero-out" or difference method where two model simulations are conducted, one with all existing sources and a second, counterfactual simulation with all existing sources and the new source emissions, with the difference being taken as the contribution from the new or modifying source.
- Instrumented techniques such as:
    - Source apportionment tools where the precursor emissions from the new or modifying source are tracked to provide a contribution estimate for that individual source; or,
    - Higher-order decoupled direct method (HDDM) which tracks the sensitivity of results to the emissions from a new or modifying source to provide coefficients relating source emissions to air quality response.

The NACAA Workgroup final report notes that these approaches represent fundamentally different methods and may result in different estimates for secondary $PM_{2.5}$ impacts depending on the non-linear chemical processes. The EPA, state/local permitting agencies, and others within the atmospheric modeling community continue to apply these techniques to test and evaluate their suitability for estimating single source impacts on secondarily formed $PM_{2.5}$. These efforts are critically important to inform current application of these models and techniques for purposes of assessing the secondary $PM_{2.5}$ impacts from a proposed new or modifying source, as well as to inform efforts to evaluate updates to Appendix W with new analytical techniques or models for ozone and secondary $PM_{2.5}$ per the commitments contained in the EPA's January 4, 2012 grant of the July 28, 2010 petition filed by the Sierra Club.[66]

Photochemical grid models that have been instrumented with source apportionment techniques track emissions from specific sources through the chemical transformation, transport, and deposition processes to estimate the source's contribution to predicted air quality at downwind receptors (Baker and Foley, 2011).[67] Source sensitivity approaches provide information about how model predicted concentrations change based on an increase or decrease in emissions from a specific source. The difference in air quality between the original baseline simulation and the simulation where emissions are perturbed provides a quantitative estimate of that source's contribution to the cumulative impact estimate.

Another approach to differentiate the contribution of single sources on changes in model predicted air quality is the higher-order decoupled direct method (HDDM), which tracks

[66] Several photochemical grid modeling approaches that allow for estimation of the secondary PM2.5 impacts from a proposed new or modifying source were presented during the Emerging Models / Techniques Session of the 10th Modeling Conference. Additional information regarding and presentations from the 10th Modeling Conference can be found on the SCRAM website at: http://www.epa.gov/ttn/scram/10thmodconf.htm."

[67] Baker and Foley, 2011. A nonlinear regression model estimating single source concentrations of primary and secondarily formed PM2.5. K. Baker and K. Foley. Atmospheric Environment. 2011; 45:3758–67.

the sensitivity of model results to emissions for a specific source through all chemical and physical processes in the modeling system (Bergin et al., 2008).[68] Sensitivity coefficients relating source emissions to air quality are estimated during the model simulation and output at the resolution of the photochemical grid model. An important difference between source apportionment and source sensitivity is that source apportionment answers the "contribution" question, "How much did a source contribute overall to modeled air quality?" and source sensitivity answers the "responsiveness" question, "How will modeled air quality change if the source's emissions change?"' [69]

Additional guidance on assessing impacts on ozone and secondarily formed fine particulate matter from individual sources also provides clarification on when "Absolute" or "direct" and "Relative" modeling approaches are appropriate.[70] There we state:

"For the purposes of single source impact assessments for permit review programs, the absolute modeled concentrations are compared to significance thresholds. Photochemical models used for the purposes of projecting future year design values for ozone and PM2.5 attainment demonstrations are processed to estimate relative response factors at key monitors with the change in model response on the highest modeled days in the baseline period (U.S. Environmental Protection Agency, 2014).[71] One reason for using relative response factors in area attainment demonstrations is to minimize uncertainty in the different components of the emission inventory. Since project source emissions are well characterized and known, the use of the absolute impact estimate by a photochemical grid model is appropriate in single source permit applications. Additionally, it is necessary to estimate project source impacts throughout the area impacted by a source not just at locations where monitors exist.

The relationship between photochemical model predictions of the bulk or total concentrations of O_3 and secondary $PM_{2.5}$ species and the specific impacts of a project source are not obvious and overall model performance may likely be the result of other emissions sources (e.g., not the project source which is well characterized). Therefore, conflating or deflating project source impacts so that bulk model estimates match observation data could result in unrealistic estimates of project source impacts. The emissions and emissions release characteristics of the project source should be well characterized as part of the model simulation, meaning that when placed in a realistic chemical and physical environment (e.g., chemical transport model) the downwind

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[68] Bergin et al., 2008. Single Source Impact Analysis Using Three-Dimensional Air Quality Models. M. Bergin, A. Russell, T. Odman, D. Cohan, and W. Chameldes. Journal of the Air & Waste Management Association. 2008; 58, 1351–1359.

[69] Guidance for $PM_{2.5}$ Permit Modeling, EPA-454/B-14-001; May 2014. See 'Section III.2.3 Full Quantitative Photochemical Grid Modeling.'

[70] Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM2.5, EPA-454/R-16-005, December 2016 See section '5.2 "Absolute" and "Relative" modeling approaches.'

[71] U.S. Environmental Protection Agency, 2014. Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, PM2.5, and Regional Haze. https://www3.epa.gov/ttn/scram/guidance/guide/Draft_O3-PM-RH_Modeling_Guidance-2014.pdf.

secondary impacts will be appropriately estimated when a source plume interacts with the surrounding environment."[72]

In other words, the use of a relative modeling approach, using RRFs, is appropriate for projecting overall concentrations and addressing potential bias in overall model predictions due to all sources at monitored locations but not for estimating maximum potential impacts due to emissions from a single source. The use of an RRF approach and observed data could result in unrealistic estimates of absolute maximum impacts from an individual source due to a number of other factors in the model not related to the specific source that affect overall model performance and any bias in overall model predictions. Since the emissions and characteristics of the specific source of interest are well known, the modeled impacts will be appropriately estimated. Furthermore, it is necessary to estimate the source impacts on all days to assess the maximum or worst case impacts, not just on days when monitored data exists.

We concluded that the use of direct modeled visibility impacts from CAMx is appropriate and the RRF approach suggested by the commenters does not provide a reliable estimate of the maximum potential visibility impacts from the source. We discuss comments concerning model performance elsewhere in this document. In addition, in response to comments below we also discuss issues we identified with the specific RRF approach suggested by the commenters.

In the Texas Reasonable Progress FIP, an RRF approach was utilized to evaluate the contributions from individual sources (based on actual or projected emission levels) to the total visibility impairment on the 20% worst days as identified through the monitored data. This approach was appropriate because the analysis is specific to a small set of days (the 24 worst monitored days in 2002) with those meteorological conditions that result in the highest measured visibility impairment, and focused on the overall visibility conditions and percentage contribution to the total visibility impairment from individual sources on those specific days. The visibility benefit analysis for the Reasonable Progress FIP was performed to identify how overall projected visibility conditions on the 20% worst days would change with the implementation of source specific controls. This differs from the BART analysis performed for this action that is focused on the maximum potential impacts and benefits from controls from the individual BART sources, evaluating all modeled days and using maximum emission levels. Reasonable Progress and BART are two related but fundamentally different issues and each requires an analysis that is appropriate to answer the different underlying policy questions. BART and BART screening are focused on the maximum potential impacts of a source or group of sources for an individual facility which may not correspond to the worst visibility days at the Class I area, where RP is focused on improving visibility on a set of the worst monitored days and not degrading the best/least impaired days from all sources in the modeling domain.

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[72] Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM2.5, EPA-454/R-16-005, December 2016 See section '5.2 "Absolute" and "Relative" modeling approaches.'

WShortcomings of Averaged RRF Values

EPA noted in the CAMx Modeling TSD that the averaged RRF approach utilized in Cleco's June 2016 Submittal may not capture the maximum impact from a source. EPA explained their reasoning as follows:[73]

1. The best 20% monitored visibility days (B20%) represent days with the least impact from all sources, and so are not likely to include the maximum impacts from Louisiana BART-eligible sources.
2. The worst 20% monitored visibility days (W20%) at Caney Creek represent days with significant impacts from sources in Northern Texas or the Eastern U.S., with meteorological conditions that would not necessarily correspond to high levels of transport from Louisiana BART-eligible sources.
3. Averaged together, the B20% and W20% RRFs may not contain the modeled maximum impact.

As EPA implies, when determining how to apply RRFs it is important to consider the various meteorological conditions that may occur throughout the year and ensure that representative RRFs are used. Cleco believes that using the averaged B20% and W20% RRF values—as done in Cleco's June 2016 Submittal—should characterize a variety of meteorological conditions and emissions scenarios. When paired with IMPROVE monitor data, these averaged RRF values are likely the best prospect of providing estimates of modeled visibility values that are in accordance with observed values.

It should also be noted that direct modeled individual unit impacts don't necessarily correspond with overall visibility impairment trends. So a unit's potential for higher modeled individual visibility impairment can easily occur during days with lower overall visibility impairment, and it is difficult to predict how a unit's impacts will compare against monitored IMPROVE data. As seen in Table 2-2 below, the maximum direct-modeled impacts from Brame Unit 2 occur around the 34th percentile of monitored overall impacts (73rd highest impacted date out of 111). This table also demonstrates the potential for extreme deviation between this application of the CAMx model and IMPROVE monitor data (modeled 33.04 dv vs. monitored 17.81 dv), such that EPA's reasoning may not be as definite as implied. Given the relatively poor performance of the model (See Section 4.2), Cleco maintains that utilizing the average of the B20% and W20% RRFs is generally representative of the range of visibility impacts while minimizing the likelihood of overstating potential impacts.

Table 2-2. Comparison between Modeled Impacts and IMPROVE Data on Date of EPA's Maximum Modeled Brame Unit 2 Contribution to Visibility Impairment (at Caney Creek)[74]

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[73] CAMx Modeling TSD, p. 31.

[74] Model data obtained from UNC-IE's model data workbook: LA059-013-02 UNC-IE - camx_v630.EPA-R6-2016.TX-BART.CAMxRun1.2002001-2002365.no2mod.data.template.bext_dv, Docket No. EPA-R06-OAR-2017-0129-0013; IMPROVE observed data obtained from the IMPROVE website: Daily Values Including Patched Values (Dec. 2016), http://vista.cira.colostate.edu/DataWarehouse/IMPROVE/Data/SummaryData/RHR_2015/SIA_daily_budgets_7_16.zip.

Date	Overall Modeled Impacts (dv)	Overall Modeled Rank (out of 365)	IMPROVE Monitor Data	IMPROVE Rank (out of 111)	Brame Unit 2 Absolute Maximum Impact (dv)
1/5/2002	33.04	11	17.81	73	2.05

(b)WEPA's assessment of the averaged RRF method utilized in Entergy's June 2016 submittal is flawed. In the CAMx Modeling TSD, EPA claims that the averaged RRF method used in Entergy's modeling was not sufficient to represent the maximum estimated impacts from a source. According to EPA, because the best 20% monitored visibility days (B20%) are the days with the least impact from all sources, the maximum impacts from Louisiana's BART-eligible sources are less likely to be captured. Additionally, EPA suggests that visibility at Caney Creek is influenced significantly by sources in Northern Texas and/or the Eastern United States, so W20% monitored visibility days may not represent meteorological conditions that result in high levels of visibility impacts from BART-eligible sources in Louisiana. Thus, EPA concluded that averaged B20% and W20% RRF values may not contain the modeled maximum impacts.[75]

EPA's analysis is flawed. When using RRFs, the various meteorological conditions and emissions scenarios that may occur throughout the modeled year must be considered, thus ensuring that modeled impacts are as representative of reality as possible. Entergy's June 2016 Submittal used averaged B20% and W20% RRF values to exemplify a wide range of conditions at each Class I area, and although Entergy's November 2015 Submittal contains the most technically defensible representation of CAMx modeled impacts, Entergy believes that this averaged RRF approach is appropriate and captures various meteorology and emissions circumstances necessary to estimate maximum visibility values.

EPA should seek to estimate impacts that are in line with monitored values from the IMPROVE workgroup; that goal is likely best served by use of these averaged RRFs. Given a relatively poor MPE (see Section III.B), using the averaged B20% and W20% RRF values is representative of the range of expected visibility conditions and reduces the potential for overestimation of modeled impacts.

o WWe disagree with the comment and find that the use of an RRF approach as suggested by the commenters does not provide a reliable estimate of the maximum potential visibility impacts from the source, as discussed in response to comments above. Furthermore, even if an RRF approach were acceptable, the use of the averaged B20% and W20% RRF values to calculate a single RRF value applied to all monitored data throughout the modeled year is not appropriate. As stated by the commenters, "When using RRFs, the various meteorological conditions and emissions scenarios that may occur throughout the modeled year must be considered, thus ensuring that modeled impacts are as representative of reality as possible." The

[75] CAMx Modeling TSD, at 31.

RRF approach attempts to capture the relative change in overall model results in response to a change in emissions on a specific day or group of days with certain conditions and then apply that change to monitored data for that day or group of days. These conditions include not only meteorology, but also source emissions and background concentrations transported into the modeling domain that can impact the model response to changes in emissions due to differences in transport and chemistry. The RRF value should only be applied to monitored days that have the same set of conditions as those modeled to derive the RRF. In other words, the RRF should only be applied to the monitored days that directly correspond to the modeled days included in the RRF calculation. An RRF value calculated for the 20% worst days is an assessment of how the model responds to emissions from the sources on that particular set of days. For example, in the case of Caney Creek, many of those days are characterized by transport from Northeast Texas. A different RRF value would be needed to capture the model response on days with different conditions. The use of the averaged B20% and W20% RRF values to calculate a single RRF does not represent the wide range of meteorological conditions throughout the year. A single RRF value cannot be representative of the range of conditions throughout the year, particularly when the goal of the analysis is not to determine the average impacts, but the "worse case" or maximum potential impacts. The RRF value used by Entergy and Cleco is based on only considering the conditions that result in the most and least overall impairment at the Class I area. As stated by the commenter "It should also be noted that direct modeled individual unit impacts don't necessarily correspond with overall visibility impairment trends. So a unit's potential for higher modeled individual visibility impairment can easily occur during days with lower overall visibility impairment, and it is difficult to predict how a unit's impacts will compare against monitored IMPROVE data." As demonstrated in the comments by Cleco, the day that Cleco Brame has its maximum impact does not occur during either of these periods. The maximum direct-modeled impacts at Caney Creek from Brame Unit 2 occur around the 34th percentile of monitored overall impacts (73rd highest impacted date out of 111). The maximum impacts from Entergy Nelson also do not occur during the 20% worst or best days at the impacted Class I areas. The RRF value utilized by the commenters does not reflect the model response during meteorological conditions that occur during the maximum impact day. In a hypothetical situation where the maximum impact did occur during the 20% worst days, the use of an RRF based solely on the 20% worst days would clearly be more appropriate than an RRF based on the averaged 20% best and 20% worst RRF values. The average RRF approach would result in a lower estimated impact than that estimated using just the 20% worst days RRF. Using an RRF value based on a set of days (the 20% best days) where the model is anticipated to have very little response to emissions from any source only serves to underestimate the potential impact on days where the model is expected to have a larger response. If an RRF approach were appropriate in this situation, a set of different RRF values would be needed to represent the range of meteorological conditions that impact the model response to emissions from the sources of interest. As we discuss in response to comment below, even if a day-specific RRF approach was used to capture model response on specific days and applied to the monitored data, visibility impacts would not be assessed for the 240 days due to limitations on the available monitored data.

We respond to comments concerning model performance and the initial CAMx modeling analysis submitted by the commenters elsewhere in this document.

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( )W Another argument that EPA gives with regard to the use of RRF values is that since IMPROVE monitors only record values every three days, the maximum number of visibility values that can be calculated is approximately 120 (i.e., 365 days divided by every three days yields approximately 120 observations), leaving about 240 days of days without visibility data.

This criticism is a simple matter of quantity over quality. The BART Guidelines indicate that the goal of BART visibility modeling is to determine a maximum daily visibility value. In pursuing this goal, it is important that quality of visibility estimates be a central factor. An estimated maximum visibility value based on 365 days of unreliable modeled impacts is not automatically better than 120 days of a more refined approach that accounts for potential modeling bias. On the contrary, the most realistic possible estimate of potential visibility impairment should be given the greatest consideration in evaluating individual source impacts. Since tethering model data to real monitoring data is an established method for minimizing model bias and obtaining more realistic visibility estimates, the RRF approach with only 120 days of monitor data is a more appropriate method than relying on absolute maximum, direct-modeled impacts when modeling with CAMx in a BART context.

(b)WEPA should not disregard the typical RRF methodology due to the IMPROVE workshop's sampling timeline. EPA argues that, even if it agreed with the use of RRF values for BART assessments, there would not be enough observed data to represent the complete 365 days of modeled data. The IMPROVE Workgroup only records concentrations of visibility-impairing pollutants on every third day, which yields an approximate maximum of 120 days per year of IMPROVE visibility data. Out of 365 days in a year, that leaves approximately 240 days without observed concentrations. At the core of this argument is the assumption that EPA's direct-modeled, 365-day post-processing approach yields reliable modeled impacts, which Entergy contends is not the case. To comply with the BART Guidelines' goal of determining a maximum daily visibility value, the quality of modeled visibility estimates should be given greater weight than the sheer number of observations. In other words, quality should come before quantity. Because the use of RRFs in conjunction with real monitoring data is an established procedure used to obtain the most realistic results possible with a minimum of model bias effects, Entergy believes that the RRF approach—although it is limited to only 120 days of monitor data—is a more appropriate method than absolute, direct-modeled impacts. Accordingly, EPA should not disregard Entergy's submitted modeling solely on the basis of the *number* of observations, but should evaluate post-processing methodologies based on the expected *quality* of observations.

o W We disagree with the comment. As the commenter states, the goal of BART visibility modeling is to determine a maximum daily visibility value and was never limited to only reviewing days with monitoring data at the Class I Area. It is not possible to reliably estimate the maximum value by ignoring two-thirds of the days during the modeled period. As discussed in the CAMx Modeling TSD, CALPUFF modeling is performed over a 3-year meteorological period and CAMx modeling is typically done over a period of one year and requires a demonstration that that year is a good representation of the baseline period.[76] When EPA approved the Texas BART modeling with CAMx approach in 2007 we agreed to use impacts on all modeled days and chose the maximum impact. Part of the consideration for using the maximum was that the CAMx modeling would only be for one year instead of 3 years as would be done for a CALPUFF analysis. The commenter does not provide any assessment to demonstrate that the 120 days considered in their analysis includes those days with that largest anticipated impact of their source(s) or are representative of the various meteorological conditions during the baseline period. Furthermore, as discussed elsewhere, the RRF approach utilized by the commenter does not properly assess the model behavior and anticipated visibility impacts on those days with conditions most conducive to large visibility impacts from the source. It is not appropriate to apply an RRF value that is derived from the model response on the 20% worst days (or the 20% best days, or an average of the two) to monitored days outside of those days with completely different meteorological conditions from those days used to derive the RRF value. As discussed elsewhere these 20% worst and 20% best days are not representative of the typical met conditions when Louisiana sources would transport to Caney Creek. Furthermore, the use of only 40% of the 120 days (48 days) further limits the statistical sampling such that it is less representative than if all 120 days were used for a maximum impact analysis. Even if a day-specific RRF approach was used to capture model response on specific days and applied to the monitored data, visibility impacts would not be assessed for the 240 days without monitored data. Whereas a CALPUFF based analysis uses 3 years of days (1095 days), compared to the 48 days used by commenter.

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WEPA's approval of Louisiana's CALPUFF modeling is inappropriate due to CALPUFF's inherent limitations and the significant distances between sources and Class I Areas. On multiple occasions, Entergy has provided thorough explanations of the various limitations of the CALPUFF modeling system, including in the November 2015 Submittal,[77] the 2016 CAMx Modeling Report,[78] and the April 2017 Letter.[79] One of the most critical flaws of the CALPUFF modeling system is its overly simplistic chemistry algorithms. EPA originally recommended CALPUFF in the BART Guidelines for its ability to simulate chemical transformations of NOX and SO2, but CALPUFF's less sophisticated chemistry mechanism (compared to CAMx) has been shown to cause significant modeling bias, which can inappropriately influence rulemaking decisions.

The Central Regional Air Planning Association (CENRAP) prepared a Modeling Protocol in 2005 (CENRAP Protocol) that noted CALPUFF's MESOPUFF-II chemistry algorithm "clearly

[76] See Section 1.3.6 of the Technical Support Document for CENRAP Emissions and Air Quality Modeling to Support Regional Haze State Implementation Plans available in the docket for this action for additional discussion on the selection of the 2002 modeling year for the baseline period.
[77] November 2015 Submittal, at 3-1 - 3-12.
[78] 2016 CAMx Modeling Report, at 2-1 - 3-2.
[79] April 2017 Letter, t 5-6.

neglects several environmental parameters and chemical processes that are important in simulating sulfate and nitrate formation in NO_X/SO_2 emissions source plumes."[80] These simplifications in CALPUFF's handling of chemical interactions can often "result in a systematic bias in the estimated concentrations and visibility impacts due to SO_2 and NO_X emissions sources"—often an "overestimation bias" for point sources emitting higher levels of NO_X and SO_2. The CENRAP protocol further states that this overestimation bias may lead to "unwarranted and excessive control of emissions from some sources,"[81] such that "a state or source operator may wish to apply full-science modeling methods to overcome CALPUFF's inherent limitations."[82] Full-chemistry models like CAMx have significantly more sophisticated algorithms that outclass CALPUFF's oversimplified chemistry mechanism. CALPUFF modeling should therefore be used cautiously, and the tradeoffs between the conservative but simplistic CALPUFF and the more technically reliable CAMx must be considered carefully to avoid using CALPUFF results that bring about a costly mischaracterization of modeled pollutant concentrations.

VEPA originally recommended CALPUFF in the BART Guidelines for its relative ability to simulate chemical transformations of NO_X and SO_2. However, CALPUFF's chemistry mechanism is significantly less sophisticated than full-chemistry models like CAMx, frequently leading to a mischaracterization of modeled pollutant concentrations. According to the Central Regional Air Planning Association (CENRAP) 2005 Modeling Protocol (CENRAP Protocol), CALPUFF's chemistry algorithm—MESOPUFF-II—"clearly neglects several environmental parameters and chemical processes that are important in simulating sulfate and nitrate formation in NO_X/SO_2 emissions source plumes."[83] CALPUFF's simplifications often "result in a systematic bias in the estimated concentrations and visibility impacts due to SO2 and NOX emissions sources," typically in the form of an "overestimation bias" for larger NOX and SO2-emitting point sources, which may lead to "unwarranted and excessive control of emissions from some sources."[84] The CENRAP Protocol concluded that "a state or source operator may wish to apply full-science modeling methods to overcome CALPUFF's inherent limitations."25 Thus, given the availability of more robust models like CAMx, the decision to utilize CALPUFF should be weighed carefully, with ample consideration given to the tradeoff between simplistic conservatism and greater technical reliability.

o : We disagree with the commenters and we agree with LDEQ that the CALPUFF modeling following the reviewed protocol is an appropriate tool to evaluate visibility impacts and benefits to inform a BART determination. With the use of CALPUFF modeling results included in the February 2017 LA RH SIP submittal, Louisiana concluded, and we are finalizing our approval of that determination, that the BART-eligible units at Cleco Brame Energy Center units and Entergy Nelson, Waterford, Willow Glen, Ninemile Point, and Little Gypsy have

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[80] Alpine Geophysics, LLC, CENRAP BART Modeling Guidelines, at 3-8 (Dec. 15, 2005) (CENRAP Protocol).
[81] Id. at 3-9 - 3-10.
[82] Id. at 1-5.
[83] Alpine Geophysics, LLC, CENRAP BART Modeling Guidelines, p. 3-8 (Dec. 15, 2005) (CENRAP Protocol).
[84] Id., pp. 3-9 through 3-10.

visibility impacts greater than 0.5 dv and are therefore subject to BART. Accordingly, LDEQ performed the required five-factor analyses and made BART determinations for these subject to BART sources. We disagree with the commenter's characterization of uncertainties raised that invalidate the CALPUFF modeling results. We have responded to these same type of comments in detail in our past FIP actions.[85]

In response to the court's 2002 finding in *American Corn Growers Ass'n. v. EPA* [86] that we failed to provide an option for BART evaluations on an individual source-by-source basis, we had to identify the appropriate analytical tools to estimate single-source visibility impacts. The 2005 BART Guidelines recommended the use of CALPUFF for assessing visibility (secondary chemical impacts) but noted that CALPUFF's chemistry was fairly simple and the model has not been fully tested for secondary formation and thus is not fully approved for secondary-formed particulate. In the preamble of the final 2005 BART guidelines, we identify CALPUFF as the best available tool for analyzing the visibility effects of individual sources, but we also recognized that it is a model that includes certain assumptions and uncertainties.[87] Evaluation of CALPUFF model performance for dispersion (no chemistry) to case studies using inert tracers has been performed.[88] It was concluded from these case studies the CALPUFF dispersion model had performed in a reasonable manner, and had no apparent bias toward over or under prediction, so long as the transport distance was limited to less than 300km.[89,90] As discussed above EPA has indicated historically that use of CALPUFF was generally acceptable at 300 km and for larger emissions sources with elevated stacks we and FLM representatives have also allowed or supported the use of CALPUFF results beyond 400 km in some cases.

In promulgating the 2005 BART Guidelines, we responded to comments concerning the limitations and appropriateness of using CALPUFF.[91] There we respond:

> CALPUFF is the best modeling application available for predicting a single source's contribution to visibility impairment. It is the only EPA-approved model for use in estimating single source pollutant concentrations resulting from the long range transport

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[85] For example, see Arkansas FIP, 81 FR 66332, 66355- 66413 (Sept. 27, 2016) and the Response to Comments, Docket No. EPA-R06-OAR-2015-0189; Texas FIP, 82 FR 48324 (October 17, 2017) and Modeling Response to Comments Document, Docket No. EPA-R06-OAR-2016-0611.
[86] *Am. Corn Growers Ass'n* v. *EPA,* 291 F.3d 1 (D.C. Cir. 2002).
[87] 70 FR 39104, 39121 (July 6, 2005).
[88] ''[M]ore recent series of comparisons has been completed for a new model, CALPUFF (Section A.3). Several of these field studies involved three-to-four hour releases of tracer gas sampled along arcs of receptors at distances greater than 50km downwind. In some cases, short-term concentration sampling was available, such that the transport of the tracer puff as it passed the arc could be monitored. Differences on the order of 10 to 20 degrees were found between the location of the simulated and observed center of mass of the tracer puff. Most of the simulated centerline concentration maxima along each arc were within a factor of two of those observed.'' 68 FR 18440, 18458 (April 15, 2003), 2003 Revisions to Appendix W, Guideline on Air Quality Models.
[89] Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long-Range Transport Impacts. Publication No. EPA–454/R–98–019. Office of Air Quality Planning & Standards, Research Triangle Park, NC. 1998.
[90] 68 FR 18440, 18458 (Apr. 15, 2003). (2003 Revisions to Appendix W, Guideline on Air Quality Models).
[91] 70 FR at 39121.

of primary pollutants. In addition, it can also be used for some purposes, such as the visibility assessments addressed in today's rule, to account for the chemical transformation of SO_2 and NO_X. As explained above, simulating the effect of precursor pollutant emissions on $PM_{2.5}$ concentrations requires air quality modeling that not only addresses transport and diffusion, but also chemical transformations. CALPUFF incorporates algorithms for predicting both. At a minimum, CALPUFF can be used to estimate the relative impacts of BART eligible sources. *We are confident that CALPUFF distinguishes, comparatively, the relative contributions from sources such that the differences in source configurations, sizes, emission rates, and visibility impacts are well-reflected in the model results.*

In the 2003 revisions to the Guideline on Air Quality Models, CALPUFF was added as an approved model for long range transport of primary pollutants. At that time, we considered approving CALPUFF for assessing the impact from secondary pollutants but determined that it was not appropriate in the context of a Prevention of Significant Deterioration (PSD) review because the impact results could be used as the sole determinant in denying a permit.[92] However, the use of CALPUFF in the context of the Regional Haze rule provides results that can be used in a relative manner and are only one factor in the overall BART determination. We determined the visibility results from CALPUFF could be used as one of the five factors in a BART evaluation and the impacts should be utilized somewhat in a relative sense because CALPUFF was not explicitly approved for full chemistry calculations.[93] We note that since the BART Guidelines were finalized in 2005 there has been more modeling with CALPUFF for BART and PSD primary impact purposes and the general community has utilized CALPUFF in the 300-450 km range many times (a number of examples were pointed out by a commenter) and EPA and FLM representatives have weighed the additional potential uncertainties with the magnitude of the modeled impacts in comparison to screening/impact thresholds on a case-by-case basis in approving the use of CALPUFF results at these extended ranges.

We also recognized the uncertainty in the CALPUFF modeling results when we made the decision, in the final BART Guidelines, to recommend that the model be used to estimate the 98th percentile visibility impairment rather than the highest daily impact value. We made the decision to consider the less conservative 98th percentile primarily because the chemistry modules in the CALPUFF model are simplified and likely to provide conservative (higher) results for peak impacts. Since CALPUFF's simplified chemistry could lead to model over predictions and thus be conservative, EPA decided to use the less conservative 98th percentile.[94]

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[92] 68 FR 18440 (Apr. 15, 2003).

[93] 70 FR 39104, 39123-24 (July 6, 2005). ''We understand the concerns of commenters that the chemistry modules of the CALPUFF model are less advanced than some of the more recent atmospheric chemistry simulations. To date, no other modeling applications with updated chemistry have been approved by EPA to estimate single source pollutant concentrations from long range transport,'' and in discussion of using other models with more advanced chemistry, "A discussion of the use of alternative models is given in the Guideline on Air Quality in appendix W, section 3.2."

[94] ''Most important, the simplified chemistry in the model tends to magnify the actual visibility effects of that source. Because of these features and the uncertainties associated with the model, we believe it is appropriate to use

Therefore, in recognizing some of the limitations of the CALPUFF model, we determined that use of the maximum modeled impact may be overly conservative and recommended the use of the 98th percentile value.

We disagree with the commenter's general statement that there is an acknowledged over-prediction of the CALPUFF model or an acknowledged over-estimation bias, and that the actual visibility impacts from the BART sources are lower. The CALPUFF model can both under-predict and over-predict visibility impacts when compared to photochemical grid model. For example, the 2012 ENVIRON report on *Comparison of Single-Source Air Quality Assessment Techniques for Ozone, PM2.5, other criteria pollutants and AQRVs* found that CALPUFF predicted highest 24-hr nitrate and sulfate concentrations lower than those predicted by the CAMx photochemical grid model in some areas within the modeling domain.[95] In a presentation for the 2010 annual Community Modeling and Analysis System conference, Anderson et al. (2010)[96] found that the CALPUFF model frequently predicted lower nitrate concentrations compared to the CAMx photochemical grid model, which has a much more rigorous treatment of photochemical reactions. As discussed above, model evaluations examining how the model captures the transport and diffusion of pollutants showed that the model performed in a reasonable manner for modeled distances less than 300 km.[97] The selection of the 98th percentile value rather than the maximum value was made to address concerns that the maximum may be overly conservative. Furthermore, as discussed in the above paragraph EPA and FLM representatives have approved the use of CALPUFF a number of times for ranges of 300-450 km on a case-by-case basis.

The CALPUFF modeling followed the BART guidelines and used the 98th percentile value. The BART modeling is a worst case assessment, utilizing maximum emissions,[98] assumptions of background ammonia and ozone, and simplified chemistry, modeled over a period of three years.[99] The CALPUFF modeling also does not capture the effect of competition with other emission sources for the available ammonia. The goal of this modeling is to estimate the maximum anticipated impact from the source in the vicinity of a Class I area (typically an area

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the 98th percentile— a more robust approach that does not give undue weight to the extreme tail of the distribution.'' 70 FR 39104, 39121.

[95] Comparison of Single-Source Air Quality Assessment Techniques for Ozone, PM2.5, other Criteria Pollutants and AQRVs, ENVIRON, September 2012.

[96] Anderson, B., K. Baker, R. Morris, C. Emery, A. Hawkins, E. Snyder ''Proof-of-Concept Evaluation of Use of Photochemical Grid Model Source Apportionment Techniques for Prevention of Significant Deterioration of Air Quality Analysis Requirements'' Presentation for Community Modeling and Analysis System (CMAS) 2010 Annual Conference, (October 11–15, 2010) can be found at *http://www.cmascenter.org/conference/2010/agenda.cfm*.

[97] 68 FR at 18458, 2003 Revisions to Appendix W, Guideline on Air Quality Models.

[98] 70 FR at 39129, ''We believe the maximum 24hour modeled impact can be an appropriate measure in determining the degree of visibility improvement expected from BART reductions (or for BART applicability)''

[99] 70 FR 39104, 39107–3918 of BART Rule. For assessing the fifth factor, the degree of improvement in visibility from various BART control options, the States may run CALPUFF or another appropriate dispersion model to predict visibility impacts. Scenarios would be run for the pre-controlled and post-controlled emission rates for each of the BART control options under review. The maximum 24- hour emission rates would be modeled for a period of three or five years of meteorological data.

on the order of several hundred square miles or more), and not to provide an estimate of downwind concentrations or visibility conditions for a specific place at a specific time.

CALPUFF uses a pseudo-first-order chemical reaction mechanism to model the conversion of SO_2 to SO_4 and NO_X ($NO + NO_2$) to NO_3. We find the representation of key chemical conversions of precursors to $PM_{2.5}$ in CALPUFF are appropriate for estimating a worst-case scenario for this particular source and region.

The utility of the model used must be judged based on the available data, the known limitations or simplifications inherent to the model, and the purpose of the modeling or manner in which the model results are used in informing decisions. The use of the 98th percentile value and considering a minimum of three years of meteorological data within CALPUFF provides a snapshot of the worst case visibility impacts, simulating impacts (based on maximum emissions and assumed ammonia concentrations) on a day when modeled meteorological conditions are most conducive to formation and transport of visibility impairing pollutants to a receptor within a Class I area. While there is some uncertainty in the absolute visibility impacts and benefits due to the model and some of the simplifications and assumptions used in the BART guideline modeling approach, the relative level of impact is a reliable assessment of the degree of visibility impacts and benefit from controls.

CALPUFF visibility modeling, performed using the regulatory CALPUFF model version and following all applicable guidance and EPA/FLM recommendations, provides a consistent tool for comparison with the 0.5 dv subject-to-BART threshold. The CALPUFF model, as recommended in the BART guidelines, has been used for almost every single-source BART analysis in the country and has provided a consistent basis for assessing the degree of visibility benefit anticipated from controls as one of the factors under consideration in a five factor BART analysis. Since almost all states have completed their BART analyses and have either approved SIPs or FIPs in place, there is a large set of available data on modeled visibility impacts and benefits for comparison with, and this data illuminates how those model results were utilized to screen out sources and as part of the five-factor analysis in making BART control determinations.

The regulatory status of CALPUFF was changed in the recent revisions to the Guideline on Air Quality Models (GAQM) as far as the classification of CALPUFF as a preferred model for transport of pollutants for primary impacts, not impacts based on chemistry. The recent GAQM changes do not alter the original status of CALPUFF as discussed and approved for use in the 2005 BART guidelines. The GAQM changes indicated that the change in model preferred status had no impact on the use of CALPUFF for BART.[100]

[100] 82 FR 5182, 5196 (Jan. 17, 2017). "As detailed in the preamble of the proposed rule, it is important to note that the EPA's final action to remove CALPUFF as a preferred appendix A model in this *Guideline* does not affect its use under the FLM's guidance regarding AQRV assessments (FLAG 2010) nor any previous use of this model as part of regulatory modeling applications required under the CAA. Similarly, this final action does not affect the EPA's recommendation [See 70 FR 39104, 39122-23 (July 6, 2005)] that states use CALPUFF to determine the applicability and level of best available retrofit technology in regional haze implementation plans."

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WAlthough this subject was discussed at length in the previously submitted Cleco Response Letter, EPA's inappropriate reliance on CALPUFF at distances far in excess of the established distance limits warrants that this crucial topic be revisited. Typically, EPA has limited CALPUFF use to instances where the maximum distance between sources and receptors is 300 kilometers (km). However, in two recent regulatory actions—this Proposed Approval of the Louisiana SIP revision and the Proposed Texas BART FIP[101]—EPA has arbitrarily and without technical support extended this typical threshold distance by over 100 km, stating that "CALPUFF is typically used for distances less than 300-400 km." [102]

EPA's Interagency Workgroup on Air Quality Modeling (IWAQM) reported that using CALPUFF for transport distances "beyond 200 to 300 km should be done cautiously with an awareness of the likely problems involved." In the same report, IWAQM added that "there are serious conceptual concerns with the use of puff dispersion for very long-range transport (300 km and beyond)."[103] Furthermore, when CALPUFF was adopted as EPA's preferred long range transport model, Appendix W to 40 C.F.R. part 51 stated that the "CALPUFF dispersion model…performed in a reasonable manner…so long as the transport distance was limited to less than 300 km."[104]

Consistent with this guidance, EPA has properly placed the CALPUFF distance threshold at 300 km in many recent actions. For example, in the New Mexico Regional Haze SIP, EPA supported the decision to exclude receptors from Class I areas that were located more than 300 km away from modeled sources on the basis that "CALPUFF results are less reliable at distances greater than 300 km."[105] More recently, EPA noted that "there are concerns in using CALPUFF for modeling impacts at distances much greater than 300 km from the source" in the Final Arkansas Regional Haze FIP.[106]

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[101] Proposed Rule, Promulgation of Air Quality Implementation Plans; State of Texas; Regional Haze and Interstate Visibility Transport Federal Implementation Plan, 82 Fed. Reg. 912-50 (Jan. 4, 2017).
[102] CAMx Modeling TSD, p. 5.
[103] EPA, Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts at 18 (Dec. 1998), Publication No. EPA-454/R-98-019.
[104] Final Rule, Revision to the Guideline on Air Quality Models: Adoption of a Preferred Long Range Transport Model and Other Revisions, 68 Fed. Reg. 18,458 (Apr. 15, 2003).
[105] Final Rule, Approval and Promulgation of Implementation Plans; New Mexico; Regional Haze and Interstate Transport Affecting Visibility State Implementation Plan Revisions; Withdrawal of Federal Implementation Plan for the San Juan Generating Station, 79 Fed. Reg. 60,983 (Oct. 9, 2014).
[106] Final Rule, Promulgation of Air Quality Implementation Plans; State of Arkansas; Regional Haze and Interstate Visibility Transport Federal Implementation Plan, 81 Fed. Reg. 66,394 (Sept. 27, 2016).

Considering EPA has consistently limited use of CALPUFF to distances of less than 300 km due to legitimate technical concerns, the decision to extend the allowable range well beyond 300 km in Texas and Louisiana is suspect. Cleco's Brame facility is located 352 km from Caney Creek and 422 km from Breton, outside the allowable range for reliable CALPUFF use.[107] On the basis of these large distances alone, CALPUFF should not have been utilized in making a BART determination for the BART-eligible units at the Brame facility. Moreover, when considering CALPUFF's other shortcomings (see Section 3.1), use of CALPUFF in this scenario is unjustifiable.[108]

WIt is inappropriate to rely on CALPUFF modeling for Nelson. According to EPA, the Agency's CALPUFF modeling establishes that Nelson's visibility impacts are greater than 0.5 deciviews ("dv"), the threshold that LDEQ used to determine whether BART-eligible units contribute to visibility impairment. [109] EPA's conclusion fails to address the fact that CALPUFF is an unreliable model for assessing visibility impacts from sources like Nelson, which are located more than 400 kilometers ("km") from the nearest Class I areas.[110] Nelson is located in Westlake, Calcasieu Parish, Louisiana, 425 km from Breton National Wilderness Area ("Breton") and 460 km from Caney Creek Wilderness Area in Arkansas ("Caney Creek").[111] These distances are well beyond the threshold at which CALPUFF results can be considered reliable. In fact, Nelson is located at distances *greater than 100 km* beyond the distance recommended for CALPUFF. EPA's Interagency Workgroup on Air Quality Modeling ("IWAQM") noted that "there are serious conceptual concerns with the use of puff dispersion for very long-range transport (300 km and beyond)." [112] IWAQM ultimately concluded that use of

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[107] EPA, Technical Support Document for Louisiana Regional Haze: CALPUFF Best Available Retrofit Technology Modeling Review, p. 8 (April 2017), Docket No. EPA-R06-OAR-2017-0129-0009 (CALPUFF Modeling TSD).
[108] Note that Cleco submitted CALPUFF results despite recognizing that CALPUFF is not suitable for characterizing visibility impacts from the Brame facility. Cleco acknowledged this awareness in the cover letter accompanying the July 30, 2015 submittal of a Refined CALPUFF Modeling Report – BART Applicability Screening Analysis: Cleco "…believes that the accuracy of the CALPUFF model is not sufficient for a source that is as far away from the Class I areas as Brame Energy Center." CALPUFF modeling was nevertheless submitted in expectation that it would be required by LDEQ and EPA.
[109] 82 Fed. Reg. at 32,296.
[110] Entergy has provided thorough explanations of the various limitations of the CALPUFF modeling system on multiple occasions, including in a report prepared by Trinity Consultants: "Updated BART Applicability Screening Analysis," submitted to Mr. Guy Donaldson, EPA, by Ms. Debra J. Jezouit, Counsel to Entergy (Nov. 9, 2015) ("November 2015 Submittal"); a report prepared by Trinity Consultants & All4 Inc.: "CAMx Modeling Report," submitted to Ms. Vivian Aucoin and Ms. Vennetta Hayes, LDEQ, by Ms. Kelly McQueen, Entergy (Oct. 14, 2016) ("2016 CAMx Modeling Report"); and a letter to Ms. Vivian Aucoin, LDEQ, from Ms. Kelly McQueen, Entergy: "Entergy's review of documents provided to LDEQ by U.S. EPA Region 6 on March 10, 2017: 'DRAFT BART Analysis for the Nelson Unit 6' and associated cost calculations spreadsheet; 'Review of CAMx BART Modeling performed by Trinity Consultants for Louisiana Regional Haze' (Apr. 6, 2017) ("April 2017 Letter"). Entergy's Comments on the May 19 Proposed SIP Approval supplemented the critiques described more fully in those documents.
[111] See Louisiana June 19 SIP Addendum at 3 (stating that Nelson is located 264 miles west of Breton and 286 miles south of Caney Creek).
[112] EPA, Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts, at 18 (Dec. 1998), Publication No. EPA-454/R-98-019.

CALPUFF for "transport beyond 200 to 300 km should be done cautiously with an awareness of the likely problems involved." [113]

EPA noted this CALPUFF limitation in its modeling guidelines. Appendix W to 40 C.F.R. Part 51 states that the "CALPUFF dispersion model…performed in a reasonable manner…so long as the transport distance was limited to less than 300 km." [114]

WEPA consistently followed the recommended distance of 300 km since its inception until its proposed actions on the Louisiana SIP. There are numerous instances in which EPA appropriately set the CALPUFF distance limitation at 300 km, including in several recent rulemaking actions. In the Final Arkansas Regional Haze Federal Implementation Plan ("FIP"), for example, EPA noted that "there are concerns in using CALPUFF for modeling impacts at distances much greater than 300 km from the source."[115] Similarly, in the New Mexico Regional Haze SIP, EPA supported the decision to exclude receptors from Class I areas that were located more than 300 km from modeled sources on the basis that "CALPUFF results are less reliable at distances greater than 300 km."[116] And in the Texas and Oklahoma FIP response to comments, EPA notes that use of CALPUFF beyond the distance for which it was originally promulgated—300 km— "raises concerns."[117]

It is clear that EPA's use of CALPUFF has consistently been limited in its past rulemaking actions to distances of less than 300 km due to modeling performance concerns. Inexplicably, however, in its May 19 Proposed Approval of the LA SIP, EPA extended the use of CALPUFF to a range of 300-400 km without any technical justification.[118] EPA now proposes to exceed even this threshold, as the distances between Nelson and the nearest Class I areas are 425 km and 460 km. Accordingly, CALPUFF modeling should not have been used to determine Nelson's impacts on visibility in Class I areas.

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[113] EPA-454/R-98-019, December 1998.
[114] Final Rule, Revision to the Guideline on Air Quality Models: Adoption of a Preferred Long Range Transport Model and Other Revisions, 68 Fed. Reg. 18,458 (Apr. 15, 2003).
[115] Final Rule, Promulgation of Air Quality Implementation Plans; State of Arkansas; Regional Haze and Interstate Visibility Transport Federal Implementation Plan, 81 Fed. Reg. 66,394 (Sept. 27, 2016).
[116] Final Rule, Approval and Promulgation of Implementation Plans; New Mexico; Regional Haze and Interstate Transport Affecting Visibility State Implementation Plan Revisions; Withdrawal of Federal Implementation Plan for the San Juan Generating Station, 79 Fed. Reg. 60,983 (Oct. 9, 2014).
[117] EPA, Response to Comments for the Federal Register Notice for the Texas and Oklahoma Regional Haze State Implementation Plans; Interstate Visibility Transport State Implementation Plan to Address Pollution Affecting Visibility and Regional Haze; and Federal Implementation Plan for Regional Haze, at 562 (Dec. 9, 2015), Docket No. EPA-R06-OAR-2014-0754-0087 ("Texas and Oklahoma FIP RTC").
[118] 82 Fed. Reg. at 22,945 ("However, the use of CALPUFF is typically used for distances less than 300–400 km.").

EPA should not rely on CALPUFF modeling to support BART determinations if sources are located beyond CALPUFF's allowable distance threshold. The Proposed Rule would arbitrarily extend the standard CALPUFF modeling distance threshold of 300 kilometers (km) to greater than 400 km.[119] In effect, EPA is proposing to allow the use of CALPUFF at distances more than 100 km farther than is recommended. This established 300-km threshold was originally determined by EPA's Interagency Workgroup on Air Quality Modeling (IWAQM), which noted that "there are serious conceptual concerns with the use of puff dispersion for very long-range transport (300 km and beyond)."[120] IWAQM ultimately concluded that the use of CALPUFF for transport distances "beyond 200 to 300 km should be done cautiously with an awareness of the likely problems involved." Moreover, Appendix W to 40 C.F.R. part 51 states that the "CALPUFF dispersion model…performed in a reasonable manner…so long as the transport distance was limited to less than 300km."[121]

EPA has consistently complied with this recommendation since its conception. There are numerous instances in which EPA appropriately set the CALPUFF distance limitation at 300 km, including a number of recent rulemaking actions. In the Final Arkansas Regional Haze FIP, for example, EPA noted that "there are concerns in using CALPUFF for modeling impacts at distances much greater than 300 km from the source."[122] Similarly, in the New Mexico Regional Haze SIP, EPA supported the decision to exclude receptors from Class I areas that were located more than 300 km away from modeled sources on the basis that "CALPUFF results are less reliable at distances greater than 300 km."[123] And in the Texas Reasonable Progress FIP RTC, EPA notes that use of CALPUFF beyond the distance for which it was originally promulgated—300 km—"raises concerns."[124]

CALPUFF has consistently been limited in EPA rulemaking actions to distances of less than 300 km due to modeling performance concerns, so it is unclear why EPA is proposing to extend the allowable use of CALPUFF to beyond 300 km without any technical justification. Many of Entergy's Louisiana BART-eligible sources are located more than 300 km from at least one Class I area, and one facility—the Nelson plant—is located more than 300 km from both Breton and Caney Creek (427 km from Breton and 460 km from Caney Creek).[125] EPA has deferred proposing a BART determination for Nelson until a future rulemaking, and Entergy would oppose EPA's use of CALPUFF modeling in its determination proposal. Although the significant distances alone should prevent the use of CALPUFF in making a Nelson BART determination,

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[119] Proposed Rule, 82 Fed. Reg. at 22,945.

[120] EPA, Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts at 18 (Dec. 1998), Publication No. EPA-454/R-98-019.

[121] Final Rule, Revision to the Guideline on Air Quality Models: Adoption of a Preferred Long Range Transport Model and Other Revisions, 68 Fed. Reg. 18,440, 18,458 (Apr. 15, 2003).

[122] Final Rule, Promulgation of Air Quality Implementation Plans; State of Arkansas; Regional Haze and Interstate Visibility Transport Federal Implementation Plan, 81 Fed. Reg. 66,332, 66,394 (Sept. 27, 2016).

[123] Final Rule, Approval and Promulgation of Implementation Plans; New Mexico; Regional Haze and Interstate Transport Affecting Visibility State Implementation Plan Revisions; Withdrawal of Federal Implementation Plan for the San Juan Generating Station, 79 Fed. Reg. 60,978, 60,983 (Oct. 9, 2014).

[124] Texas Reasonable Progress FIP RTC at 562.

[125] EPA, Technical Support Document for Louisiana Regional Haze: CALPUFF Best Available Retrofit Technology Modeling Review, at 8 (April 2017), Docket No. EPA-R06-OAR-2017-0129-0009 (CALPUFF Modeling TSD).

when taken with CALPUFF's numerous technical shortcomings use of CALPUFF in this instance cannot be justified.[126]

o W We disagree with the comment and we agree with LDEQ that the CALPUFF modeling following the reviewed protocol is an appropriate tool to evaluate visibility impacts and benefits to inform a BART determination. With the use of CALPUFF modeling results included in the 2017 Louisiana Regional Haze SIP submittal,[127] Louisiana concluded, and we are finalizing our approval of that determination, that the BART-eligible units at Cleco Brame Energy Center units and Entergy Nelson, Waterford, Willow Glen, Ninemile Point, and Little Gypsy have visibility impacts greater than 0.5 dv and are therefore subject to BART. Accordingly, LDEQ performed the required five-factor analyses and made BART determinations for these subject to BART sources. We disagree with the comment that the use of CALPUFF modeling is not justified because of the distances between the sources and the nearest Class I areas. As previously discussed and included in our record for our proposals,[128] LDEQ used direct CALPUFF modeling results of facilities out to 460 km for some very large EGU facilities (very large emissions from tall stacks). The commenters are incorrect in stating that EPA has consistently limited the use of CALPUFF modeling to distances less than 300 km prior to this action. We recently used CALPUFF for model plants for screening of sources beyond 360 km to a Class I Area, based on modeling of model plant sources 360 km or less to a Class I area for screening of numerous BART-eligible sources in Texas.[129] In our 2014 proposed action and the 2015 final action on Texas regional haze we approved the use of CALPUFF by TCEQ to screen BART-eligible non-EGU sources at distances of 400 to 614 km for some sources.[130] In those actions, we weighed the modeling results with the potential uncertainty of CALPUFF results at these greater distances outside the typical range of CALPUFF in deciding how to use the results in screening of facilities. We disagree with the comment that it was inappropriate to rely on CALPUFF at ranges beyond 300 or 400 km and that it would be without precedent or inconsistent with our past application of CALPUFF modeling for BART screening for sources in Texas and other states.[131] We also note that all BART-eligible EGU sources evaluated in this

[126] Entergy submitted CALPUFF modeling alongside its CAMx modeling in the expectation that CALPUFF results would be required by LDEQ and EPA. Nonetheless, Entergy has consistently explained its disagreement with the use of CALPUFF in BART determinations.

[127] CALPUFF Modeling Report BART Applicability Screening Analysis: Cleco Corporation, Brame Energy Center, Teche Power Station, Prepared by Trinity Consultants, July 30, 2015. Available in Appendix B of the 2017 Louisiana Regional Haze SIP submittal; Updated BART Applicability Screening Analysis Prepared by Trinity Consultants, November 9, 2015. Available in Appendix D of the 2017 Louisiana Regional Haze SIP submittal; DRAFT Technical Support Document for Louisiana Regional Haze: CALPUFF Best Available Retrofit Technology Modeling Review, April 2017 (revised May 2017 to include Entergy Nelson) Available in Appendix F of the 2017 Louisiana Regional Haze SIP submittal. EPA performed additional modeling for Entergy Nelson to address identified errors in some emission estimates.

[128] 82 FR 22936 (May 19, 2017), 82 FR 32294 (July 13, 2017).

[129] Texas FIP, 82 FR 912 (Jan. 4, 2017), 82 FR 48324 (October 17, 2017).

[130] 79 FR 74818 (Dec. 16, 2014), 81 FR 296 (Jan. 5, 2016).

[131] For example, South Dakota used CALPUFF for Big Stone's BART determination, including its impact on multiple Class I areas further than 400 km away, including Isle Royale, which is more than 600 km away. See 76 Fed. Reg. 76656. Nebraska relied on CALPUFF modeling to evaluate whether numerous power plants were subject to BART where the "Class I areas [were] located at distances of 300 to 600 kilometers or more from" the sources. See Best Available Retrofit Technology Dispersion Modeling Protocol for Selected Nebraska Utilities, p. 3. EPA Docket ID No. EPA-R07-OAR-2012-0158-0008.

action are located less than 300 km from the nearest Class I area with the exception of Cleco Brame and Entergy Nelson.

EPA has indicated historically that use of CALPUFF was generally acceptable at 300 km or greater for larger emissions sources with elevated stacks. We and FLM representatives have also allowed or supported the use of CALPUFF results beyond 400 km in some cases other than the Texas actions.[132] EPA has a higher confidence level with results within 300 km and when analysis of impacts at Class I areas within 300 km is sufficient to inform decisions on BART screening and BART determinations, such as in the situations in New Mexico and Arkansas identified by the commenters, we have often limited the use of CALPUFF results to within 300 km as there are fewer questions about the suitability of the results. However, that does not preclude the use of model results for sources beyond the 300 km range with some additional consideration of relevant issues such as stack height, size of emissions, etc. As discussed above, EPA and FLM representatives have utilized CALPUFF results in a number of different situations when the range was between 300-450 km or more.

LDEQ utilized direct CALPUFF modeling for screening of some EGU sources out to 460 km. The modeled impacts of those facilities determined to be subject-to-BART in this screening modeling presented in the 2017 Louisiana Regional Haze SIP submittal were well above the 0.5 del-dv.[133] As discussed in the CALPUFF Modeling TSD, we find the CALPUFF modeling included in the February and October 2017 SIP submittals[134] to be consistent with EPA and FLM guidance and acceptable for the purposes of evaluating the anticipated visibility impacts for BART screening and the visibility benefits that can be achieved with the use of controls at the subject-to-BART facilities in Louisiana.

The BART Guidelines recommend the use of "CALPUFF or other appropriate model,"[135] following appropriate guidance[136], and calls for the development of a modeling protocol. We

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[132] For example, South Dakota used CALPUFF for Big Stone's BART determination, including its impact on multiple Class I areas further than 400 km away, including Isle Royale, which is more than 600 km away. See 76 Fed. Reg. 76656. Nebraska relied on CALPUFF modeling to evaluate whether numerous power plants were subject to BART where the "Class I areas [were] located at distances of 300 to 600 kilometers or more from" the sources. See Best Available Retrofit Technology Dispersion Modeling Protocol for Selected Nebraska Utilities, p. 3. EPA Docket ID No. EPA-R07-OAR-2012-0158-0008.
[133] Modeled impacts for Entergy Nelson and Cleco Brame exceeded 1 dv at both impacted Class I areas (Breton and Caney Creek). See LA CALPUFF Modeling Report with Nelson.pdf.
[134] CALPUFF Modeling Report BART Applicability Screening Analysis: Cleco Corporation, Brame Energy Center, Teche Power Station, Prepared by Trinity Consultants, July 30, 2015. Available in Appendix B of the 2017 Louisiana Regional Haze SIP submittal; Updated BART Applicability Screening Analysis Prepared by Trinity Consultants, November 9, 2015. Available in Appendix D of the 2017 Louisiana Regional Haze SIP submittal; DRAFT Technical Support Document for Louisiana Regional Haze: CALPUFF Best Available Retrofit Technology Modeling Review, April 2017 (revised May 2017 to include Entergy Nelson) Available in Appendix F of the 2017 Louisiana Regional Haze SIP submittal. EPA performed additional modeling for Entergy Nelson to address identified errors in some emission estimates.
[135] 40 CFR Appendix Y, IV.D.5
[136] For example: Interagency Workgroup on Air Quality Modeling (IWAQM) Phase 2 Summary Report and Recommendations for Modeling Long Range Transport Impacts, U.S. Environmental Protection Agency, EPA–454/R–98–019, December 1998.

agree with LDEQ that the CALPUFF model following the reviewed protocol is an appropriate tool to evaluate visibility impacts and benefits to inform a BART determination. In addition to the CALPUFF modeling, we performed our own CAMx modeling following the BART Guidelines and consistent with previously agreed techniques and metrics of the Texas CAMx BART screening protocol (EPA, Texas, and FLM representatives approved)[137,138] to provide additional information on visibility impacts and impairment and address possible concerns with utilizing CALPUFF to assess visibility impacts at Class I areas located far from these emission sources. CAMx is a photochemical modeling platform with a full chemistry mechanism that is also suited for assessing visibility impacts from single facilities/sources at longer distances where CALPUFF is more uncertain (such as distances much greater than 300 km). EPA previously approved the use of CAMx for determining source impacts for BART screening purposes for sources in Texas,[139,140] and EPA decided to supplement the CALPUFF analysis for some large coal-fired sources in Louisiana with CAMx modeling. This CAMx modeling (in addition to CALPUFF modeling performed by EPA) was shared with LDEQ and is included in the LA RH SIP submittal (see Appendix F). Our CAMx modeling of these coal-fired sources further supports the conclusion that these sources cause or contribute to visibility impairment, are subject to BART, and that the magnitude of the assessed impacts for Cleco Brame and Entergy Nelson are well above 0.5 del-dv for these facilities that fell into the greater than 300 km range. As we discuss in the CAMx modeling TSD and elsewhere in this response to comments document we consider the additional CAMx modeling submitted by Entergy and Cleco to LDEQ to not be in accordance with the BART Guidelines and a previous modeling protocol developed by EPA, Texas and FLM representatives for the use of CAMx modeling for BART screening,

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[137] Texas had over 120 BART eligible facilities located at a wide range of distances to the nearest class I areas in their original Regional Haze SIP. Due to the distances between sources and Class I areas and the number of sources, Texas worked with EPA and FLM representatives to develop a modeling protocol to conduct BART screening of sources using CAMx photochemical modeling. Texas was the only state that screened sources using CAMx and had a protocol developed for how the modeling was to be performed and what metrics had to be evaluated for determining if a source screened out. See Guidance for the Application of the CAMx Hybrid Photochemical Grid Model to Assess Visibility Impacts of Texas BART Sources at Class I Areas, ENVIRON International, December 13, 2007, available in the docket for this action.

[138] EPA, TCEQ, and FLM representatives verbally approved the approach in 2006 and in email exchange with TCEQ representatives in February 2007 (see email from Erik Snyder (EPA) to Greg Nudd of TCEQ Feb. 13, 2007 and response email from Greg Nudd to Erik Snyder Feb. 15, 2007, available in the docket for this action).

[139] Texas had over 120 BART eligible facilities located at a wide range of distances to the nearest class I areas in their original Regional Haze SIP. Due to the distances between sources and Class I areas and the number of sources, Texas worked with EPA and FLM representatives to develop a modeling protocol to conduct BART screening of sources using CAMx photochemical modeling. Texas was the only state that screened sources using CAMx and had a protocol developed for how the modeling was to be performed and what metrics had to be evaluated for determining if a source screened out. See Guidance for the Application of the CAMx Hybrid Photochemical Grid Model to Assess Visibility Impacts of Texas BART Sources at Class I Areas, ENVIRON International, December 13, 2007, available in the docket for this action.

[140] EPA, TCEQ, and FLM representatives verbally approved the approach in 2006 and in email exchange with TCEQ representatives in February 2007 (see email from Erik Snyder (EPA) to Greg Nudd of TCEQ Feb. 13, 2007 and response email from Greg Nudd to Erik Snyder Feb. 15, 2007, available in the docket for this action).

does not properly assess the maximum baseline impacts, and is not valid for supporting any determination of visibility impacts below 0.5 dv.

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Wb PA failed to determine whether the visibility improvement modeled for Nelson was within CALPUFF's margin of error. In *National Parks Conservation Ass'n v. EPA*, 788 F.3d 1134, 1146-47 (9th Cir. 2015) ("Montana Case"), the U.S. Court of Appeals for the Ninth Circuit concluded that EPA must demonstrate how it can reasonably anticipate model-predicted visibility improvements that are within a model's margin of error. Trinity Consultants completed a margin of error analysis for the Nelson BART-eligible units similar to the one used in the Montana Case to demonstrate that the Montana's units' incremental visibility improvement was within the model's margin of error. The results of Trinity's analysis show that the CALPUFF predicted visibility impairment at Caney Creek and Breton is within the margin of error calculated for each Class I area.

Nelson Plant Margin of Error Analysis Results

Unit	Class I Area	Baseline Visibility Impact (dv)[1]	Calculated Margin of Error (dv)[1]	BART Threshold (dv)	Margin of Error from Montana Case (dv)[2]
Nelson Plant	Caney Creek	0.748	1.38	0.5	0.39
	Breton	0.798	1.25		
Nelson Unit 4	Caney Creek	0.044	1.38		
	Breton	0.040	1.25		
Nelson Unit 6	Caney Creek	0.703	1.38		
	Breton	0.770	1.25		
Nelson Aux. Boiler	Caney Creek	0.008	1.38		
	Breton	0.010	1.25		

[1] Values determined by the Nelson Plant Study (98th percentile).

[2] Values from the Montana Case: "Accuracy of Visibility Protocol Modeling in BART Evaluations," prepared by Gale F. Hofnagle, TRC Environmental Corporation (June 15, 2012).

Additional details on this analysis are presented in Entergy's November 2015 Submittal.[141] EPA failed to explain how it could reasonably anticipate visibility improvement from Nelson when the predicted improvement is within CALPUFF's margin of error. Accordingly, the CALPUFF results cannot be the basis on which the Nelson units' BART applicability is based.

o **W**The commenter mischaracterizes the Ninth Circuit decision regarding the "margin of error" of the model. The commenter suggests that the Court agreed that the anticipated visibility benefits in that case were within the margin of error of the model. This is incorrect. The Ninth Circuit decision cited did not rule on any specific issue related to CALPUFF. Rather, the court ruled on a procedural error that EPA did not respond to the comment received regarding the CALPUFF margin of error in its rulemaking as required under the law.[142] Here and elsewhere in our previous response to comments we address a very similar comment with respect to CALPUFF modeling for Arkansas sources, as well as the commenter's analysis claiming to estimate the "margin of error".

We respond to comments concerning a very similar "margin of error" analysis in our response to comments and final action for Regional Haze in Arkansas.[143] The Trinity analysis discussed in the comment above purports to calculate a "margin of error" of the CALPUFF modeling for Entergy Nelson. In general, the commenter's analysis adds CALPUFF model results for a specific source or sources with CAMx model results and compares this value to visibility conditions derived from monitored data at each Class I area. This analysis is flawed for many reasons as discussed in detail in our Arkansas RTC document that discusses a similar analysis performed for Entergy Lake Catherine[144] and fails to provide any assessment of the ability of the CALPUFF model to evaluate visibility impacts or the degree of visibility improvement that may be expected from available control technology to inform BART and reasonable progress evaluations. Whether or not the modeled visibility impacts or benefits lie below this calculated "margin of error" is immaterial to any assessment of whether or not the visibility impairment or benefits from controls can reasonably be anticipated to occur. We note that the commenter did not provide any spreadsheets or detailed calculations to support this analysis, therefore we were unable to fully review and respond to the individual calculations or specific methodology underlying the presented values in the commenter's summary report and comments.

As discussed elsewhere in this document, we are confident that CALPUFF distinguishes, comparatively, the relative contributions from sources such that the differences in source configurations, sizes, emission rates, and visibility impacts are well-reflected in the model results. We agree with LDEQ that the CALPUFF model following the reviewed protocol is an appropriate tool to evaluate visibility impacts and benefits to inform a BART determination.

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[141] November 2015 Submittal, at 3-9 ◌ 3-10.
[142] "Concurring, Judge Berzon wrote separately to emphasize her understanding that the lead opinion is not impugning the EPA's use of the CALPUFF model generally, but only requiring a sufficiently reasoned response to a particular comment regarding CALPUFF's usefulness in these specific circumstances." *Nat'l Parks Conservation Ass'n* vs. *EPA*.
[143] see Arkansas FIP, 81 FR 66332, 66355- 66413 (Sept. 27, 2016) and the Response to Comments Document, Section 7.d. "Margin of Error in CALPUFF modeling ", Docket No. EPA-R06-OAR-2015-0189.
[144] see Arkansas Response to Comments Document, Section 7.d. "Margin of Error in CALPUFF modeling ", Docket No. EPA-R06-OAR-2015-0189.

Furthermore, our CAMx modeling of coal-fired sources included in the LA RH SIP (see appendix F) further supports the conclusion that the Entergy Nelson and Cleco Brame sources are subject to BART.

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WEPA should not have included modeled nitrogen dioxide in its assessment of visibility impacts. Visibility impacts in Class I areas are estimated through the use of an empirical equation called the IMPROVE algorithm, which uses concentrations of visibility-impairing pollutants to estimate light extinction. The current form of the IMPROVE algorithm was adopted for use by the IMPROVE Steering Committee in 2005 after undergoing several revisions from the former original IMPROVE algorithm.[145] These revisions, including the addition of a new term for nitrogen dioxide (NO_2), were intended to bring the algorithm into better agreement with observed visibility values by improving the correlations between monitored pollutant concentrations and the resulting estimated light extinction values.[146]

Use of this revised IMPROVE algorithm has been standard in visibility analyses since its release. As far as CAMx BART analyses are concerned, however, inclusion of the modeled NO_2 extinction term is relatively recent, as the ability to track an individual source's NO2 pollutant concentrations via CAMx's Particulate Matter Source Apportionment Technology (PSAT) was only made standard in version 6.30 (the version used in EPA's assessment).[147] Taking advantage of this new feature, EPA's Louisiana BART modeling assessment incorporates an NO_2 term into individual source impact calculations.

However, in its description of the revised algorithm, the IMPROVE Technical Subcommittee for Algorithm Review specifies that the addition of the NO_2 absorption term is dependent on the availability of NO_2 data at the Class I areas under evaluation: "addition of a NO_2 light absorption term…would only be used at sites with available NO2 concentration data."[148] In the case of EPA's CAMx modeling assessment of Louisiana sources, neither of the considered Class I areas monitors NO_2 concentrations. Thus, it is inappropriate for EPA to include modeled NO_2 concentrations in its individual source impact calculations, because the inclusion of NO_2 is unverifiable with monitor data.

W he IMPROVE algorithm is an empirical equation that is used to estimate levels of visibility impairment in Class I areas. Monitored or modeled concentrations of visibility-impairing pollutants are input to the algorithm in conjunction with Class I area-specific

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[145] IMPROVE Technical Subcommittee for Algorithm Review, Gray Literature, Revised IMPROVE Algorithm for Estimating Light Extinction from Particle Speciation Data, http://vista.cira.colostate.edu/Improve/gray-literature/ (Jan. 2006), Docket No. EPA-R06-OAR-2017-0129-0012 (Revised IMPROVE Algorithm Report).
[146] Marc Pitchford, et al., Revised Algorithm for Estimating Light Extinction from IMPROVE Particle Speciation Data, Journal of the Air & Waste Management Association, JAWMA, 57.11, pp. 1,326-36 (2007).
[147] Ramboll Environ, CAMx Version 6.30 Release Notes (April 2016).
[148] Revised IMPROVE Algorithm Report, p. 13.

parameters (e.g., relative humidity factors) to estimate light extinction. The IMPROVE algorithm version currently in use was adopted by the IMPROVE Steering Committee in 2005,[149] and includes several revisions to the original version that were anticipated to better align the estimated visibility values with observed values.[150] One specific addition to the algorithm was a new term for estimation of light extinction due to concentrations of nitrogen dioxide (NO_2).

In describing this revised algorithm, the IMPROVE Technical Subcommittee for Algorithm Review noted that the "addition of a NO_2 light absorption term…would only be used at sites with available NO_2 concentration data."[151] Thus, use of the NO_2 absorption term was intended to be dependent on the availability of NO_2 data at the receptor.

The revised IMPROVE algorithm has been used in countless visibility analyses since its release, but inclusion of a modeled NO_2 extinction term in CAMx-based BART analyses is fairly recent, owing to the fact that CAMx's Particulate Matter Source Apportionment Technology (PSAT) was only given the ability to track individual NO_2 concentrations in 2016 in version 6.30 (the version used in EPA's assessment).[152] EPA attempts to take advantage of this new capability in its Louisiana modeling by evaluating NO_2 impacts at Breton and Caney Creek. However, neither of these Class I areas observe ambient NO_2 concentrations. Thus, because inclusion of NO_2 is unverifiable with monitor data, EPA should not have included modeled impacts from this pollutant in evaluating BART-eligible sources.

o **W**We disagree with the comment and believe it is appropriate to include the modeled visibility impairment due to nitrogen dioxide in assessment of visibility impacts form a source. The IMPROVE Technical Subcommittee for Algorithm Review noted that "[l]ight extinction due to the gaseous components of the atmosphere are relatively well understood and well estimated for any atmospheric conditions. Absorption of visible light by gases in the atmosphere is primarily by NO_2, and can be directly and accurately estimated from NO_2 concentrations by multiplying by the absorption efficiency."[153] The statement from the IMPROVE Technical Subcommittee that the NO_2 light absorption term should only be used at sites with available NO_2 concentration data is concerning estimation of overall visibility conditions from available

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[149] IMPROVE Technical Subcommittee for Algorithm Review, Revised IMPROVE Algorithm for Estimating Light Extinction from Particle Speciation Data, http://vista.cira.colostate.edu/Improve/gray-literature/ (Jan. 2006), Docket No. EPA-R06-OAR-2017-0129-0012-43 (Revised IMPROVE Algorithm Report).
[150] Marc Pitchford, et al., Revised Algorithm for Estimating Light Extinction from IMPROVE Particle Speciation Data, Journal of the Air & Waste Management Association, JAWMA, 57.11, at 1,326-1,336 (2007)
[151] Revised IMPROVE Algorithm Report, at 13.
[152] Ramboll Environ, CAMx Version 6.30 Release Notes (April 2016).
[153] Revised IMPROVE Algorithm Report, at 1.

monitor data.[154] The subcommittee clarifies that the revised algorithm includes a term for NO_2 absorption for those IMPROVE sites that record NO_2 measurements.

Nevertheless, the estimated light extinction based on our CAMx modeling from NO_2 due to these sources is a very small fraction of the total modeled visibility impact. For Cleco Brame, the contribution to total extinction due to NO_2 is less than 0.5% on the top ten impact days, with an average of 0.12% across these ten days at Caney Creek.[155] For Entergy Nelson the contribution to total extinction due to NO_2 is less than 0.7% on the top ten impact days, with an average of 0.17% across these ten days at Caney Creek.[156] Therefore, the subject to BART determination and assessment of visibility benefits based on our CAMx modeling are insignificantly impacted by the inclusion or exclusion of impairment from modeled nitrogen dioxide.

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x zW Model performance evaluations, or MPEs, are intended to provide a level of confidence in a model's ability to adequately simulate observedpollutant concentrations during the modeled time frame. Similarly, MPEs can support the isolation and identification of specific causes for poor model performance (e.g., meteorological data, emissions inputs, or other input files and settings). As part of its CAMx evaluation, UNC-IE and EPA performed an MPE to assess the quality of the CAMx model's predicted impacts in relation to monitored IMPROVE data.

The figure below presents one element of the MPE—an evaluation of the modeled total $PM_{2.5}$ concentrations.

UNC-IE's Total $PM_{2.5}$ Model Performance Evaluation (EPA's CAMx Run 1) [157]

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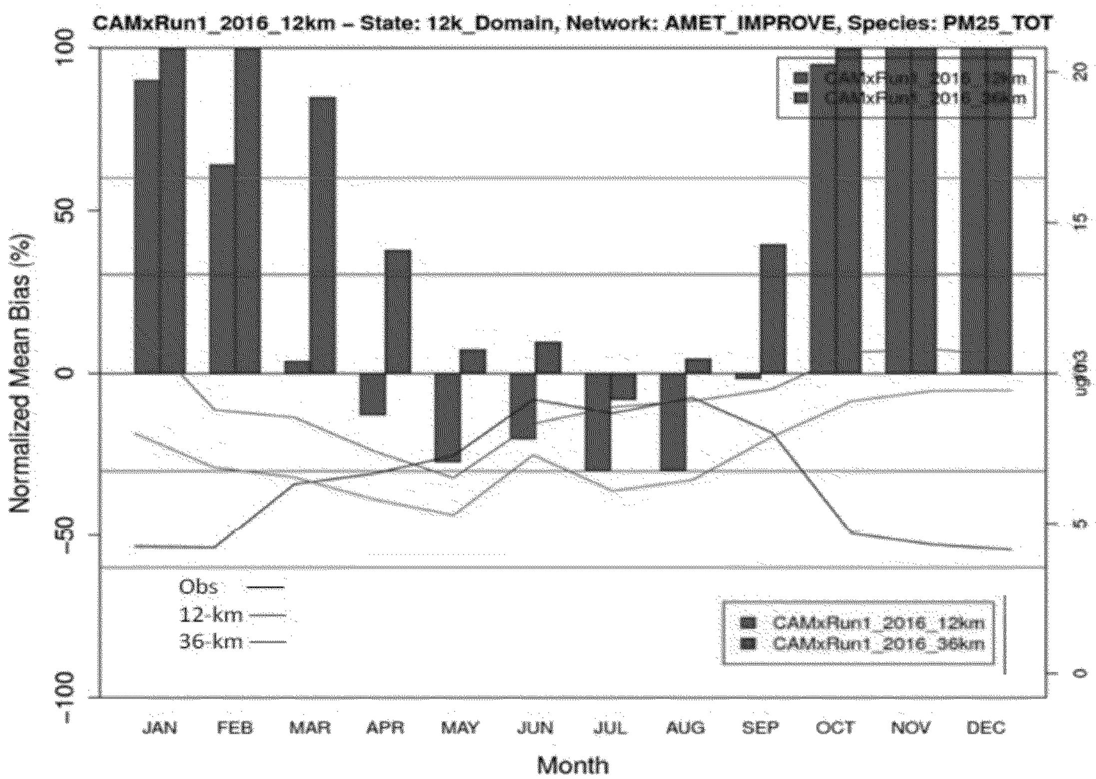
154 "The goal was to develop a revised algorithm that reduces biases in light extinction estimates, and is as consistent as possible with the current scientific literature while constrained by the need to use only those data that are routinely available from the IMPROVE particle monitoring network." Revised IMPROVE Algorithm Report, at 4

155 See results: "camx_v630.EPA-R6-2016.TX-BART.CAMxRun1.final.xlsx" for base case model results, including species specifics extinction and total visibility impairment from each unit and subject-to-BART source.
156 See results: "camx_v630.EPA-R6-2016.TX-BART.CAMxRun3.final.xlsx" for base case model results, including species specifics extinction and total visibility impairment from each Nelson unit and the Nelson subject-to-BART source.
157 UNC Institute for the Environment, Regional Haze Evaluation Under Contract EP-D-11-084 Work Assignment No. 4-17: TASK 5, Subtask 2: Conducting CAMx PiG with PSAT Source Apportionment for BART screening (CAMx Run #1), (Dec. 7, 2016), Docket No. EPA-R06-OAR-2017-0129-0013 (UNC-IE Task 2 Memo).



The figure above indicates that EPA's baseline modeling perform ance is variable, showing a high over-prediction bias during the cooler months of the year, and a mild under-prediction bias during the warmer months. The 12 km grid simulation misses the model performance goal for total $PM_{2.5}$ during five out of twelve months of the year (October through F ebruary), with normalized mean bias values exceeding 60%. The normalized mean bias values in N ovember and December are notably 100% or higher.[158]

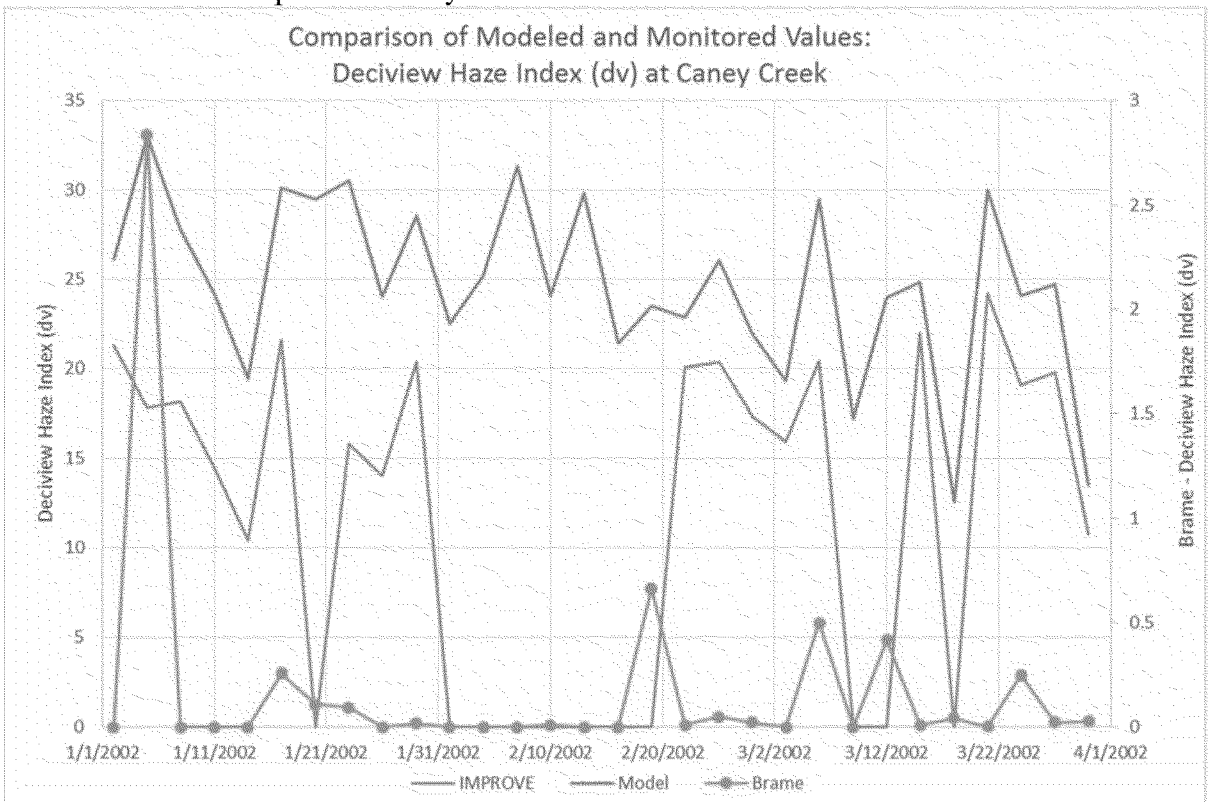
Despite EPA and UNC-IE's conclusi on that the modeling meets EPA 's performance guidelines, this MPE indicates a relatively poor model performance. The severe over-prediction bias throughout the colder months of t he year indicates that direct-modeled results have a significant likelihood for being overstated, and it is inappropriate for EP A to rely on the absolute maximum direct-modeled impacts in making its BART determinations.

For example, the maximum Cleco Brame facility impacts were predicted to occur at Caney Creek during the months that the MPE shows had particularly poor mode l performance, on January 5, 2002. Yet, EPA unaccountably based its conclusions about the Brame facility on this absolute maximum value without giving prop er consideration to the possibility that the predicted Brame impacts could suffer from the same over-prediction bias that th e overall concentrations exhibit.

[158] CAMx Modeling TSD, p. 18.

If EPA had completed source-specific assessments for facilities like Brame, it would have seen the connection between overall bias and individual source impacts. The figure below presents Trinity's assessment of Brame for the first quarter of 2002 (January 1 through March 31) using the EPA and UNC-IE modeling outputs. This assessment demonstrates the relationship between individual source impacts and predictions of overall visibility at Caney Creek. The Brame facility impacts tend to spike on days that the overall model performance spikes as well.[159]

Observed IMPROVE Predictions Compared with Overall Visibility Model Predictions and Individual Source Impacts at Caney Creek[160]



In the CAMx Modeling TSD, EPA compares its CAMx modeling with a 2006/7 Community Multi-Scale Air Quality model (CMAQ) assessment performed for CENRAP by Environ in an attempt to account for the elements of the MPE not meeting the EPA performance guidelines.[161] However, as discussed in greater detail in the below subsections, these explanations are flawed

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[159] Note that in Figure 4-2, the dates where the IMPROVE monitor data appears to go to zero are actually days for which no observed data is available.

[160] Model data obtained from UNC-IE's model data workbook: LA059-013-02 UNC-IE - camx_v630.EPA-R6-2016.TX- BART.CAMxRun1.2002001-2002365.no2mod.data.template.best_dv, Docket No. EPA-R06-OAR-2017-0129-0013; IMPROVE observed data obtained from the IMPROVE website: Daily Values Including Patched Values (Dec. 2016), http://vista.cira.colostate.edu/DataWarehouse/IMPROVE/Data/Summ aryData/RHR_2015/SIA_daily_budgets_7_16.zip.

[161] CAMx Modeling TSD, pp. 18-24.

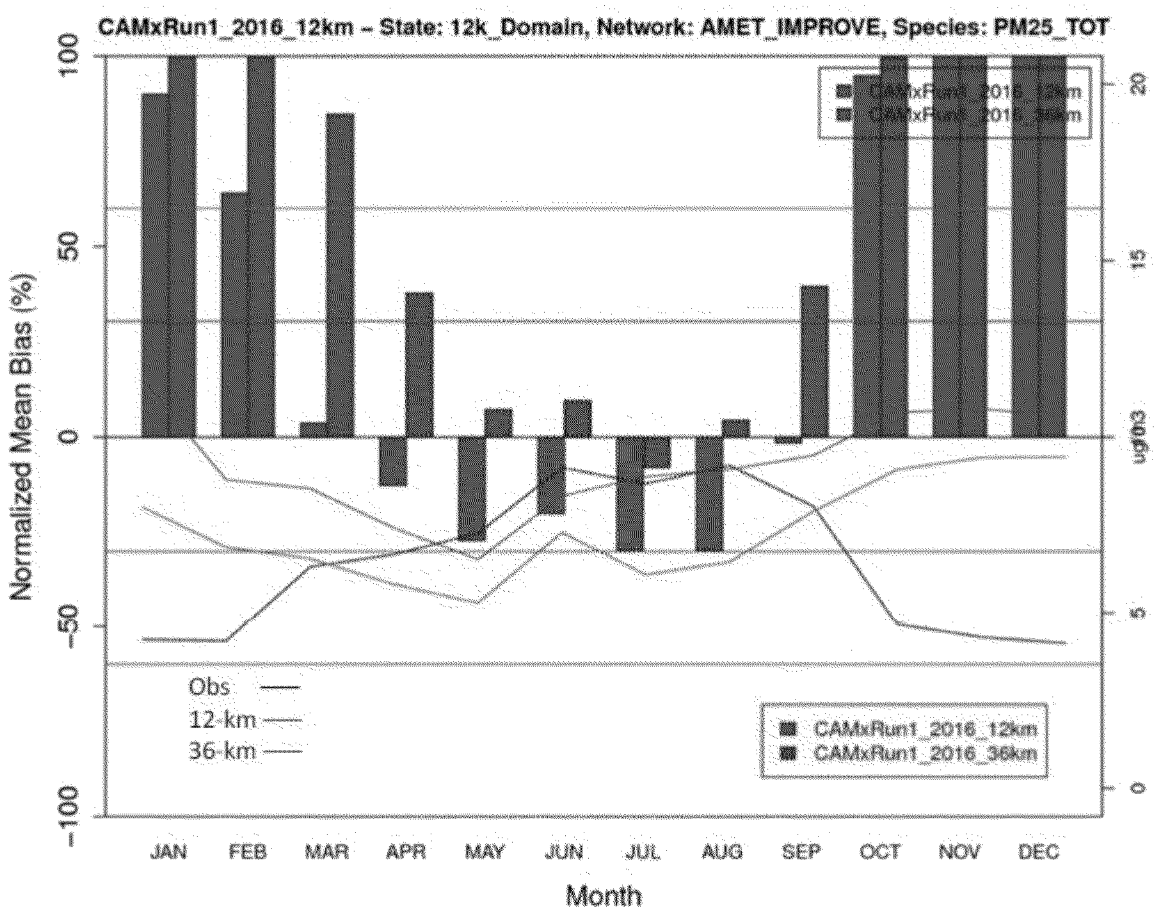
and lack adequate evidence to support the ultimate conclusion that the overall model performance is acceptable.

(b) The Results of EPA's Model Performance Evaluation Raise Concerns, Especially with Regard to EPA's Reliance on Absolute Maximum, Direct- Modeled Impacts

The intended purpose of an MPE is to assess whether a model can adequately simulate the various conditions that influence pollutant concentrations. In the case of visibility analyses, these conditions may include meteorological effects, emissions transport, and the chemical interaction of pollutants in the atmosphere. Additionally, MPEs can often identify causes of poor model performance, such as errors in emissions inputs or problems with meteorological data. UNC-IE and EPA performed an MPE to evaluate the quality of the baseline CAMx modeling scenario (CAMx Run 1) relative to observed IMPROVE data.

UNC-IE's Total $PM_{2.5}$ Model Performance Evaluation (EPA's CAMx Run 1)[162]

[162] UNC Institute for the Environment, Regional Haze Evaluation Under Contract EP-D-11-084 Work Assignment No. 4-17: TASK 5, Subtask 2: Conducting CAMx PiG with PSAT Source Apportionment for BART screening (CAMx Run #1) (Dec. 7, 2016), Docket No. EPA -R06-OAR-2017-0129-0013-05 (UNC-IE Task 2 Memo).



The Figure above displays UNC-IE's evaluation of the modeled total $PM_{2.5}$ concentrations. This graph demonstrates a variable modeling performance, with a severe over-prediction bias during cooler months of the modeled year and a slight under-prediction bias during warmer months. Notably, the simulation on the 12 km grid failed to meet model performance goals for total $PM_{2.5}$ from October through February (five months of the year), during which time normalized mean bias values exceeded 60%. The normalized mean bias values in November and December are *100% or higher*.[163] EPA and UNC-IE ultimately concluded that this CAMx modeling assessment meets EPA's performance guidelines. However, the relatively poor performance indicated by this MPE warrants greater concern than EPA acknowledges. There is a severe overestimation bias during the cooler months and, despite the slight underestimation bias during the remaining months of the year, this MPE illustrates why EPA should not use the absolute maximum, direct-modeled impacts to make BART determinations. EPA attempts to defend its conclusion that the modeling assessment generally meets EPA's performance guidelines by providing possible explanations as to why certain elements of the MPE do not comply with the performance guidelines (e.g., nitrate over-predictions). As part of these explanations, EPA compared the results of its CAMx modeling with a 2006/7 Community Multi-Scale Air Quality model (CMAQ) analysis

[163] CAMx Modeling TSD, at 18.

performed for CENRAP by Environ.[164], EPA's explanations do not include passable supporting evidence, and the overall modeling performance remains subject to concern.

o **W** The EPA firmly believes that the peer reviewed science clearly demonstrates that photochemical grid models can adequately assess single-source impacts.[165] Photochemical grid models are suitable for estimating visibility and deposition since important physical and chemical processes related to the formation and transport of PM are realistically treated. Source sensitivity and apportionment techniques implemented in photochemical grid models have evolved sufficiently and provide the opportunity for estimating potential visibility and deposition impacts from one or a small group of emission sources using a full science photochemical grid model.[166] As we discuss in response to comments above, our guidance on assessing impacts from single sources provides clarification on when "Absolute" or "direct" and "Relative" modeling approaches are appropriate when using photochemical grid models.[167] The use of a relative modeling approach, using RRFs, is appropriate for projecting overall concentrations and addressing potential bias in overall model predictions but not for estimating maximum potential impacts due to emissions from a single source. The use of an RRF approach and observed data could result in unrealistic estimates of absolute maximum impacts from an individual source due to a number of other factors in the model not related to the specific source that affect overall model performance and any bias in overall model predictions. Since the emissions and characteristics of the specific source of interest are well known, the modeled impacts will be appropriately estimated. Model performance for chemical transport models in the context of single source impact assessments for well characterized sources is intended to provide confidence in the chemical environment of the source and does not provide specific information about the amount or directionality of possible error in modeled source impacts.[168] In the case of the BART screening modeling, the use of maximum emissions for a number of specific modeled sources further complicates attempts to draw conclusions on the degree of over or under prediction of particulates from a comparison of overall modeled concentrations to observed values at specific Class I areas.

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[164] *Id.* at 18-24.

[165] Revisions to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches To Address Ozone and Fine Particulate Matter. 82 FR 5182, 5194 (January 17, 2017).

[166] Id.at 5196

[167] Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM2.5, EPA-454/R-16-005, December 2016 See section '5.2 "Absolute" and "Relative" modeling approaches.'

[168] Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM2.5, EPA-454/R-16-005, December 2016 See section "4.8 Model Evaluation".

The CAMx screening analysis was built upon the regional photochemical modeling utilized in our earlier action on Texas Reasonable Progress ("EPA R6 Texas RH study")[169]; which was built from the 2002 annual regional photochemical modeling database developed for CENRAP and utilized by Texas for their Regional Haze SIP and BART screening with CAMx.[170] We received assistance in conducting modeling runs from University of North Carolina at Chapel Hill, Institute for the Environment (UNC-IE). Because the current CAMx modeling performed by UNC used the EPA R6 Texas RH CAMx[171] as a platform for the modeling for the impact of the Texas and Louisiana BART sources with (a) changes to the model version, (b) conversion of inputs from the previous version of the model to be used in the current version and, most significantly, (c) modifications to the emission inventory for the BART sources to allow modeling for screening of maximum visibility impacts, analysis was conducted to determine the performance relative to EPA modeling guidelines and determine the relative performance of the modeling system to that of the previous CAMx modeling using the platform.[172] The CAMx Modeling TSD summarizes the modeling protocol, the differences between our CAMx modeling analysis and the original analysis developed by CENRAP, and provides a summary of UNC's analysis along with further interpretation and supporting information. EPA and UNC's overall conclusion was that, with limited exceptions, the current CAMx modeling performance corresponds to the previous modeling and that it meets the EPA performance guidelines.

There are two instances where the current CAMx modeling is significantly different from the previous modeling; for one of which the performance does not meet the EPA model guidelines. In the first, although CAMx was found to have a high bias for nitrates in the cooler season in the previous modeling, the current result shows an even higher bias which is above the modeling guideline. In the second, the $PM_{2.5}$ spatial plots show that the current modeling concentrations are elevated relative to the previous modeling. Both of these findings are explained by considering the emissions that were used in the BART analysis modeling. The purpose of the BART Screening modeling was not to simulate actual overall visibility conditions for comparison with monitored values. The modeling exercise was designed to assess the maximum potential impact from several BART-eligible sources. As such, 3 Louisiana BART sources (7 units) along with 9 Texas BART sources (22 units) were modeled with maximum 24-hr emission rates for NOx, SO2 and PM instead of their actual emissions for the modeled period. or these

169 ENVIRON. 2013. "Memorandum: 2002 Baseline CAMx Simulation, Texas Regional Haze Evaluation", prepared by ENVIRON International Corporation for EPA Region 6 (RTI Contract EP-W-011-029). February 21, 2013.

170 ENVIRON and CERT. 2007. "Technical Support Document for CENRAP Emissions and Air Quality Modeling to Support Regional Haze State Implementation Plans", prepared for the Central Regional Air Planning Association, prepared by ENVIRON International Corporation, and the University of California, Riverside. September 12.

171 The regional photochemical modeling utilized in our earlier action on Texas Reasonable Progress. ENVIRON. 2013. "Memorandum: 2002 Baseline CAMx Simulation, Texas Regional Haze Evaluation", prepared by ENVIRON International Corporation for EPA Region 6 (RTI Contract EP-W-011-029). February 21, 2013.

172 "Regional Haze Evaluation Under Contract EP-D-11-084 Work Assignment No. 4-17: TASK 5, Subtask 2: Conducting CAMx PiG with PSAT Source Apportionment for BART screening (CAMx Run #1)", Memorandum from Zac Adelman and Uma Shankar, UNC Institute for the Environment to Erik Snyder, EPA Region 6, December 7, 2016. Available in the docket for this action as "EPA-R6_RH_Task2_Memo_UNC_07Dec2016.pdf"

sources, daily SO_2 and NOx emissions were modeled at the maximum level of 2,240 tons per day SO_2 and 573 tons per day NOx compared to average emissions of 1,338 tons per day of SO_2 and 362 tons per day NOx. We would expect higher modeled nitrate, sulfate, and overall $PM_{2.5}$ at the Class I areas relative to observed levels and those levels previously modeled because all the BART sources are modeled at these maximum emissions levels for NOx, SO_2, and PM for the entire modeled year, rather than actual emission levels. As nitrate concentrations are typically low during the summer months due to chemistry primarily favoring sulfate generation in warmer conditions, we would expect the difference between modeled nitrate in the BART Screening modeling and observed/previously modeled nitrate to be more pronounced during the winter months when nitrate concentrations are elevated.

As discussed in the CAMx Modeling TSD, we also compared the results of this BART modeling with the 2006/2007 evaluation of the CENRAP modeling [173] used by all CENRAP states, including Louisiana, to project future visibility conditions and identify contributions to visibility impairment from different sources types and regions. There we note that since the Class I area sets for CENRAP and the BART Screening modeling from the CAMx modeling performed by Region 6 differ substantially in the sources impacting them and in source to monitor transport, the comparison is not one-to-one (See figure 3.1-1 of the CAMx Modeling TSD). The CENRAP evaluation included comparisons with IMPROVE monitoring sites in Minnesota, Iowa, Kansas and Nebraska. The BART screening modeling and evaluation does not include these northern IMPROVE sites, but includes numerous western sites in New Mexico and Colorado In addition, the emissions from the tagged BART-eligible sources have been enhanced with more emissions for the purposes of the BART impact analysis in the BART Screening modeling, and the model and chemical mechanism have been updated between evaluations. Because of these differences, the model performance in each evaluation is influenced by different factors related to how well the model and model inputs capture the emissions, transport, chemistry and meteorological conditions that impact each set of IMPROVE sites. In addition, the relative importance of nitrate and sulfate performance at different times of the year may differ between the two, as the CENRAP evaluation includes more northern sites that are typically more impacted by nitrate than the sites located further south. Therefore, while we can generally evaluate relative model performance between the two evaluations, it is difficult to draw conclusions on why model performance differs or is similar between the two evaluations for a particular species or time period. In general, we concluded that the model on the average is underestimating the impact of sources of SO_2 on particulate sulfate during the warmer months. Nitrate is also under-predicted in the summer months and overestimated in the winter. We also note in the TSD, that due to the overall emission levels in the base case scenario, the base case modeled impacts for sources may be underestimated due to the higher overall emissions of SO_2 and NOx in the base case model scenario and more competition for reactants that lead to formation of visibility impairing particulate than would be seen in a cleaner ambient conditions.

Understanding the model performance, and recognizing that model performance is generally consistent with previous regional haze modeling analyses that were determined to be reliable for the purposes of regional haze planning, we concluded that:

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173 Technical Support Document for CENRAP Emissions and Air Quality Modeling to Support Regional Haze State Implementation Plans available in the docket for this action.

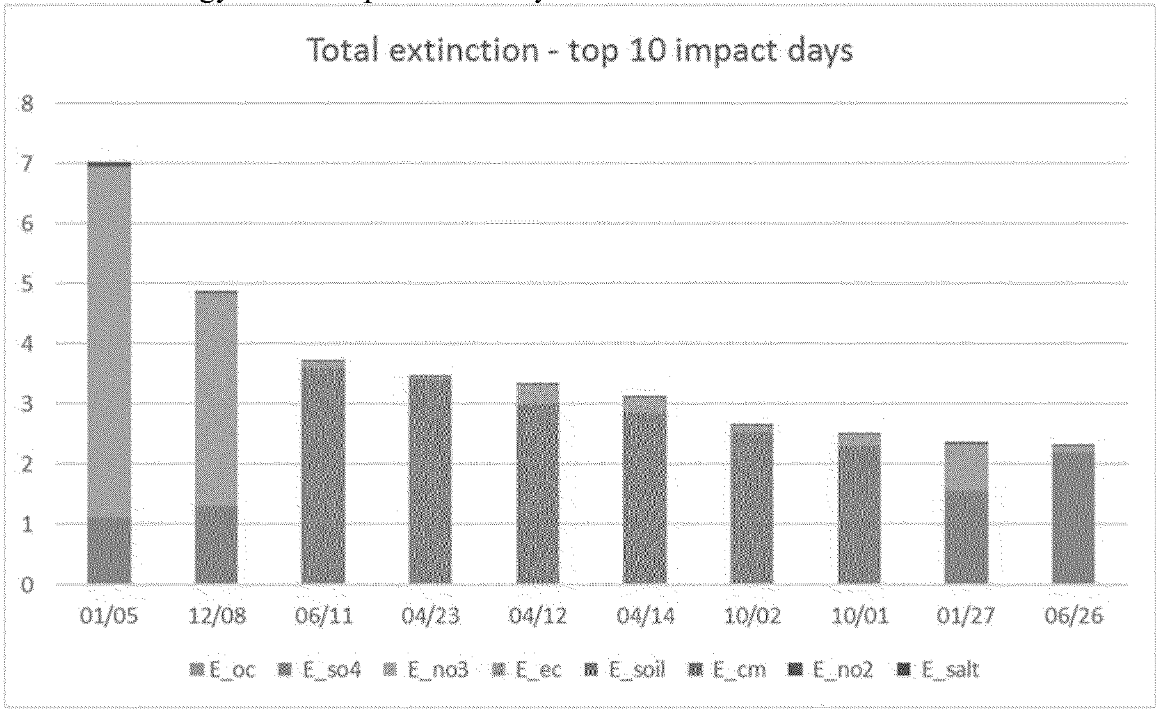
"[U]sing the absolute values of the modeling, this underestimate of sulfate impacts in the summer results in: (a) the impacts of the BART-eligible sources are likely underestimated and the actual impacts would be greater, and (b) the visibility benefits modeled for the BART-eligible facilities are likely underestimated, the actual benefits would be greater,… even in the presence of the high bias for nitrates in the cooler months since the emission reductions being considered are for SO_2 which is a precursor for sulfates." [174]

We disagree with the comment that we based our conclusions about the Brame facility solely on the absolute maximum value of modeled impact, which the commenter notes occurred during the winter, without any consideration of the over-prediction bias for nitrate. We reviewed all the model results and evaluated not only the maximum impact, but the number of days impacted over 1.0 dv and 0.5 dv. We noted in our proposal and TSDs that with our CAMx modeling Cleco Brame had 30 days with modeled impacts exceeding 0.5 dv at Caney Creek and 10 days over 1.0 dv. We also provided model results for base case and control scenario runs for all days, including species specific extinction for review [175] and summarized the modeled impacts for base case and visibility benefits of controls for the maximum impacted days, the average across the top ten impacted days, and the annual average impacts (excluding days impacted less than 0.1 dv). The chart below summarizes the species specific contributions for the top ten most impacted baseline days (all ten days have impacts greater than 1 dv) for Cleco Brame Energy Center at Caney Creek. On seven of these ten days, visibility impairment due to sulfate is greater than 90% of the total visibility impact. These seven days occur during the warmer months, including days in April through early October, when model performance indicates that these modeled visibility impacts are likely under-predicted. Considering all the available modeling data, we concluded that based on modeling of base line emissions, the source is anticipated to cause or contribute to visibility impairment and is subject to BART. This supports the subject to BART determination made by LDEQ based on CALPUFF modeling that also showed visibility impacts above the 0.5 dv threshold.

[174] CAMX Modeling TSD, Section 3.1.

[175] See "camx_v630.EPA-R6-2016.TX-BART.CAMxRun1.final.xlsx" for base case model results, including species specifics extinction and total visibility impairment from each unit and subject-to-BART source. Similar data for the high control model results: "camx_v630.EPA-R6-2016.TX-BART.CAMxRun3.final.xlsx" and low control model results: "camx_v630.EPA-R6-2016.TX-BART.CAMxRun4.final.xlsx" are also available in the docket for this action.

Cleco Brame Energy Center impacts at Caney Creek



With respect to the Nelson source, we noted in our proposal andTSDs that with our CAMx modeling Entergy Nelson had 31 days with modeled impacts exceeding 0.5 dv at Caney Creek and 9 days over 1.0 dv. The days with the two largest modeledimpacts (greater than 2 dv; more than four times the visibility impact threshold) occur in Apriland over 90% of the total visibility impairment is due to sulfate on those days. This supports thesubject to BART determination made by LDEQ based on CALPUFF modeling that also showed visibility impacts above the 0.5 dv threshold.

2. Nitrate Over-Predictions

( )W*Nitrate Over-Predictions*

EPA makes the argument that nitrate concentrations are significantly over-predicted compared to observed values due to the fact that the BART sources are beingmodeled at required maximum 24-hour emission rates. By attempting to excuse the significant nitrate over-prediction bias in this way—without offering any solution to account for the effects this bias may have on individual source predictions—EPA is implicitly arguing that modeled nitrate concentrations from individual sources are acceptable despite overall nitrate predictions being significantly higher than monitored values. However, this argument is not sufficiently supported by evidence.

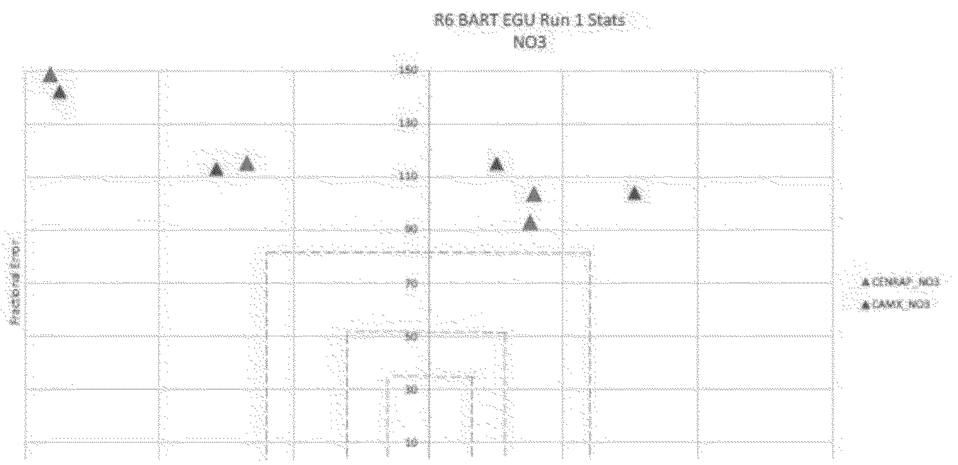
For example, the absolute maximum modeled impact from Cleco's Brame Unit 2 is composed almost entirely of nitrates and occurs during the winter months, which are specifically singled out as having a significant nitrate over-prediction bias. In looking at this specific example, where the overall modeled haze index is 33.04 dv as compared to the monitored value of 17.81 dv, it is difficult not to infer that the model's tendency to over-predict overall nitrate concentrations is inherent to the model and may influence predictions of nitrates from individual sources as well.

EPA's own analysis at least partly supports the idea that the u se of maximum 24-hour emission rates is not the sole cause of nitrate over-predictions. In the figure below, the plotted comparison of EPA's CAMx modeling (with maximum 24-hour emission rates) and the previous CENRAP CMAQ modeling (without maximum 24-hour emission rates), it is dear that model over-predictions of nitrates are typical in cooler months. In fact,EPA's CAMx modeling only exhibited a higher fractional bias in two out of the four representative months considered.[176]

Thus, there is some evidence that the general nitrate over-prediction bias evident in the MPE may factor into individual source modeled concentrations and result in overstated impacts from individual sources (e.g., the overall maximum impacts from Brame Unit 2 are likely an outlier prediction caused by CAMx's nitrate over-prediction tendency in this analysis). EPA must assess and account for the potential effects of modeling bias on indiv idual source concentrations; otherwise, impacts from sources are bound to be overstated. EPA 's use of the absolute maximum direct-modeled impacts is unsupportable, and an alternate post- processing approach based on RRFs and IMPROVE monitor data should be utilized instead.

Nitrate Model Fractional Model Bi as Comparison between CENRAP CMAQ and EPA's CAMx Run 1[177]

	CENRAP		R6 CAMX	
Month	Frac Bias	Frac Error	Frac Bias	Frac Error
January	37.8	92.9	76.6	104
April	-67.4	115.2	-78.7	113
July	-140.5	148.4	-137	142
October	39.3	103.6	25.4	115



[176] Note that although these two assessments are not directly comparable, they provide useful general model performance information—CAMx Modeling TSD, p. 19, 23).

[177] CAMx Modeling TSD, p. 22.

(b) *EPA’s Implied Argument that Nitrate Over-Predictions Will Not Affect Individual Source Impacts Lacks Supporting Evidence*

EPA argues that the cause of the observed nitrate overestimation bias is the use of maximum 24-hour emission rates for the BART-eligible sources, but does not provide any solution to counteract the potential effects this bias may have on individual source predictions. EPA is implying that, regardless of how much overall nitrate concentrations are overestimated, modeled nitrate concentrations from individual sources are still acceptable. However, this argument is not supported by adequate evidence.

EPA’s own analysis indicates that modeling with maximum 24-hour emission rates is not the only cause of the observed nitrate over-predictions. In the soccer goal plot presented in the CAMx Modeling TSD comparison of model performance metrics from EPA’s CAMx modeling (with BART-eligible sources at maximum 24-hour emission rates) and the previous CENRAP CMAQ modeling (without elevated emissions) indicates that the overestimation of nitrates may be related more to time of year (i.e., cooler months) and modeling capabilities than to the use of maximum 24-hour emission rates. In fact, EPA’s CAMx modeling exhibits higher fractional bias in only two of the four months considered in the comparison, which supports the theory that nitrate overestimation is not necessarily caused by the artificially heightened BART emission rates.[178] It is logical to assume, then, that predictions of individual source concentrations are affected by the same model tendencies affecting overall concentration predictions. Therefore, if overall nitrates are significantly overestimated during the cooler months of the year, it is possible—maybe even likely—that nitrate concentrations attributable to an individual source are likewise overestimated.

Thus, it is possible that modeled concentrations attributable to individual sources maybe affected by the general nitrate over-prediction bias revealed by the MPE, thereby resulting in overstated individual source impacts. EPA must account for the potential effects of modeling bias, or the impacts from individual sources are likely to be exaggerated. The observed overestimation of nitrates demonstrates why the absolute maximum direct-modeled impact is an inappropriate metric, and EPA should reconsider other post-processing methodologies that utilize RRFs.

Nitrate Model Fractional Model Bias Comparison between CENRAP CMAQ and EPA’s CAMx Run 1[179]

[178] Although these two assessments are not directly comparable, they provide useful general model performance information—CAMx Modeling TSD, at 19, 23.

[179] CAMx Modeling TSD, at 22.

	CENRAP		R6 CAMX	
Month	Frac Bias	Frac Error	Frac Bias	Frac Error
January	37.8	92.9	76.6	104
April	-67.4	115.2	-78.7	113
July	-140.5	148.4	-137	142
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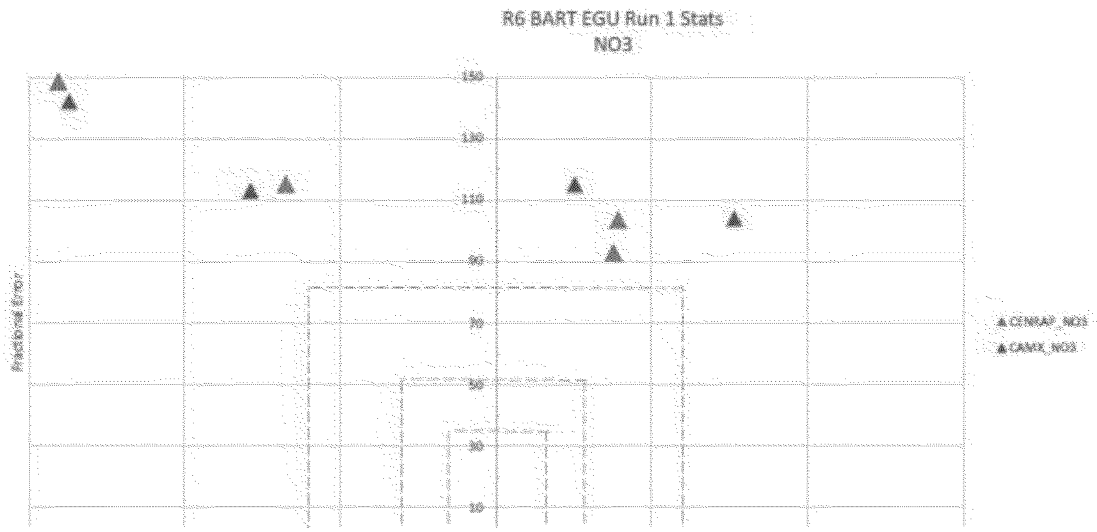

o WWe disagree with the commenters characterization of our discussion on nitrate model performance. We do not find that nitrate concentrations are over-predicted compared to observed values solely due to the fact that the BART sources are being modeled at required maximum 24-hour emission rates. As discussed in detail in the previous response to comment and in the CAMx Modeling TSD, we found that the difference in model performance between our previous modeling (EPA R6 Texas RH study) and the current BART Screening modeling was explained by considering the difference in emissions used in the two modeling analyses. The difference in the degree of over-prediction of nitrate during the cooler months between these two analyses was explained by the use of 24-hr maximum emissions. We acknowledge in the CAMx Modeling TSD, that the CENRAP modeling as well as the additional EPA modeling runs show a tendency for over-prediction of total overall nitrate during the cooler months.

The EPA firmly believes that the peer reviewed science clearly demonstrates that photochemical grid models can adequately assess single-source impacts.[180,181] As we discuss in response to comments above, our guidance on assessing impacts from single sources provides clarification on when "Absolute" or "direct" and "Relative" modeling approaches are appropriate when using photochemical grid models.[182,183] The use of a relative modeling approach, using RRFs, is not appropriate for estimating maximum potential impacts due to emissions from a single source. The use of an RRF approach and observed data could result in unrealistic estimates of absolute maximum impacts from an individual source due to a number of other factors in the model not related to the specific source that affect overall model performance and any bias in overall model predictions, such as uncertainties in the overall NOx emission inventory. We note that NOx emissions are fairly evenly distributed across non-EGU point, EGU point, non-road mobile, on-road mobile and area sources in the 2002 emission inventory. Since the emissions and characteristics of the specific source of interest are well known, the modeled impacts will be appropriately estimated. Model performance for chemical transport models in the context of single source impact assessments for well characterized sources is intended to provide confidence in the chemical environment of the source and does not provide specific information about the amount or directionality of possible error in modeled source impacts.[184] In the case of the BART screening modeling, the use of maximum emissions for a number of modeled sources further complicates attempts to draw conclusions on the degree of over or under prediction of nitrates from a comparison of overall modeled concentrations to observed values at specific Class I areas.

As discussed above, we did not solely consider the maximum modded visibility impact, but also considered the number of days impacted over 0.5 dv and 1 dv, modeled impacts on all days, including species specific extinction,[185] and summarized the modeled impacts for the maximum impacted days, the average across the top ten impacted days, an d the annual average impacts (excluding days impacted less than 0.1 dv). Many of the days w ith large modeled visibility impacts due to emissions from Cleco Brame Energy Center (sevenout of the top ten impact days, all impacts greater than 1 dv) and Entergy Nelson (two highestimpact days with impacts over 2 dv) are during the warmer months where nitrate impacts are notsignificant and visibility

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[180] Revisions to the Guideline on Air Quality Models: Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches To Address Ozone and Fine Particulate Matter. 82 FR 5182, 5194 (January 17, 2017).

[181] Guidance for $PM_{2.5}$ Permit Modeling, EPA-454/B-14-001; May 2014. See 'Section III.2.3 Full Quantitative Photochemical Grid Modeling.'

[182] Id.

[183] Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM2.5, EPA-454/R-16-005, December 2016 See section '5.2 "Absolute" and "Relative" modeling approaches.'

[184] Guidance on the Use of Models for Assessing the Impacts of Emissions from Single Sources on the Secondarily Formed Pollutants: Ozone and PM2.5, EPA-454/R-16-005, December 2016 See section "4.8 Model Evaluation"

[185] See "camx_v630.EPA-R6-2016.TX-BART.CAMxRun1.final.xlsx" for base case model results, including species specifics extinction and total visibility impairment from each unit and subject-to-BART source. Similar data for the high control model results: "camx_v630.EPA-R6-2016.TX-BART.CAMxRun3.final.xlsx" and low control model results: "camx_v630.EPA-R6-2016.TX-BART.CAMxRun4.final.xlsx" are also available in the docket for this action.

impairment is dominated by sulfates. Our model results confirm the determination by LDEQ based on CALPUFF modeling that these sources cause or contribute to visibility impairment and are subject to BART.

3K p r Jm

( )W*Sulfate Under-Predictions*

In contrast to modeled nitrates, sulfate concentrations in EPA's CAMx assessment were typically more likely to be under-predicted than over-predicted. In light of this aspect of the MPE, EPA concluded that "the impacts of the BART-eligible sources are likely underestimated and the actual impacts would be greater."[186]

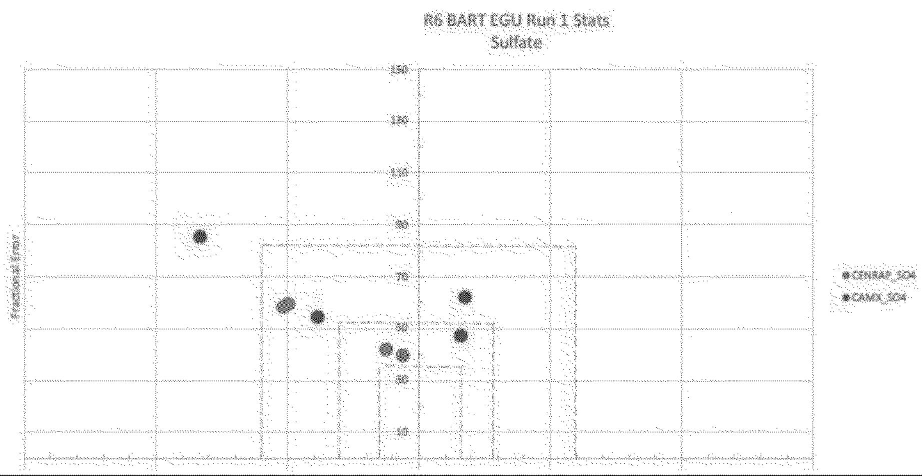
In this case, EPA is reversing their implied argument regarding nitrates. In essence, EPA is saying that with regard to sulfates, because the overall concentrations are being underestimated for part of the year, individual source impacts are likely also being underestimated, in which case the actual impacts due to sulfates from individual sources would be higher than predicted. This is in contrast to EPA's implication that the over-predicted overall nitrate concentrations shouldn't affect the perception of individual source impacts (even in cases where individual source impacts are dominated by nitrate concentrations). Without more substantial evidence, it is inappropriate to assume that overall nitrate prediction bias will not affect individual source concentrations but overall sulfate prediction bias will. EPA's inconsistency in this analysis of the MPE is inappropriate and should be corrected.

Further, EPA's statement that the impacts of BART-eligible sources are likely greater than the model predicts is baseless. Whether the actual impacts are greater or less than the model values is dependent on the date under consideration. For example, the fractional bias of sulfates in October is listed as 17.6% (see Figure 4-4) so it stands to reason that there is a chance an individual source's real impacts may be underestimated during the month of October, rather than overestimated as EPA suggests. Ultimately, based on the MPE, EPA cannot suggest a likelihood of sulfate under-prediction without simultaneously suggesting the likelihood of nitrate over-prediction.

Figure 4-4. Sulfate Model Fractional Model Bias Comparison between CENRAP CMAQ and EPA's CAMx Run 1[187]

[186] Id., pp. 23-24.
[187] CAMx Modeling TSD, p. 21.

	CENRAP CMAQ		R6 CAMX Run1	
Month	Frac Bias	Frac Error	Frac Bias	Frac Error
January	-12.4	41.9	16	47.2
April	-51.6	58.2	-38.5	54.4
July	-49.6	59.4	-83.2	85.3
October	-6.1	39.6	17.6	62.0



xb zW*Overall Sulfate Under-Predictions Do Not Necessarily Indicate Individual Source Under-Predictions*

Modeled sulfate concentrations in EPA's CAMx Run 1 scenario were typically more likely to suffer from underestimation bias than overestimation bias. Based on this observation, EPA determined that "the impacts of the BART-eligible sources are likely underestimated and the actual impacts would be greater."[188]

Contrary to its statements regarding nitrates, EPA is claiming that, because the overall sulfate concentrations are typically under-predicted, individual source impacts also are likely under-predicted. EPA then assumes that actual sulfate concentrations from individual sources are likely higher than the model predicts. In a complete reversal from its conclusion that overall nitrate overestimations should not affect how individual source nitrate concentrations are perceived, EPA concludes that overall sulfate under-predictions likely apply to individual source sulfate concentrations as well. EPA's inconsistency in evaluating nitrates versus sulfates is arbitrary and capricious. EPA cannot suggest that individual source sulfate concentrations are likely under-predicted without also admitting that individual source nitrate concentrations likely are over-predicted.

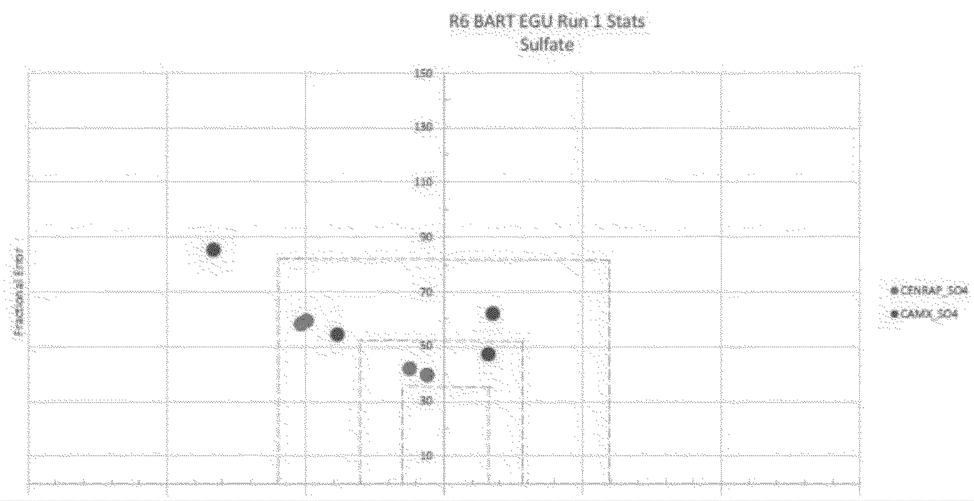
Moreover, EPA has no basis for its conclusion that impacts from BART-eligible sources are likely greater in reality than the model predicts. Since the level of over- or under-

[188] CAMx Modeling TSD, pp. 23-24.

prediction bias is dependent on time of year, EPA should expect that the date under consideration will be a significant factor in whether actual impacts are likely greater or less than the modeled impacts. For example, an individual source's modeled sulfate concentrations are more likely underestimated by the model during January rather than overestimated as EPA suggests, because the average fractional bias of sulfates is identified as 16% inJanuary.

Figure 3. Sulfate Model Fractional Model Bias Comparison between CENRAP CMAQ and EPA's CAMx Run 1[189]

	CENRAP CMAQ		R6 CAMX Run1	
Month	Frac Bias	Frac Error	Frac Bias	Frac Error
January	-12.4	41.9	16	47.2
April	-51.6	58.2	-38.5	54.4
July	-49.6	59.4	-83.2	85.3
October	-6.1	39.6	17.6	62.0



o WThe commenters fail to present the full context of our discussion on sulfate model performance. We stated that due to the underestimate of sulfate impacts ***in the summer*** the impacts of the BART-eligible sources are likely underestimated and the actual impacts would be greater. Unlike NOx emissions that are fairly evenly distri buted across non-EGU point, EGU point, non-road mobile, on-road mobile and area sources, SO_2 emissions are primarily due to point sources and are well charac terized. During the warmer mon ths of the year, impacts from nitrates are not significant and visibility impairment is primarily due to sulfates. Because the model performance indicates a tendency to under-predict sulfate concentrations during these warmer months, overall SO_2 emissions are well characterized, and these BART sources are a

189 *Id.* At 21.

significant component of the SO_2 emissions, it is likely that impacts from these sources are under-predicted by the model results.

As discussed above, we did not solely consider the maximum modded visibility impact, but also considered the number of days impacted over 0.5 dv and 1 dv, modeled impacts on all days, including species specific extinction, [190] and summarized the modeled impacts for the maximum impacted days, the average across the top ten impacted days, an d the annual average impacts (excluding days impacted less than 0.1 dv). Many of the days w ith large modeled visibility impacts due to emissions from Cleco Brame Energy Center (7 outof the top ten impact days, all impacts greater than 1 dv) and Ent ergy Nelson (two highest impa ct days with impacts over 2 dv) are during the warmer months where nitrate impacts are not significant and visibility impairment is dominated by sulfates. Thus the nitrate overestimation conce rns are not significant with respect to the magnitude of the impacts during these warmer months. Our model results confirm the determination by LDEQ based on CAL PUFF modeling that these sources cause or contribute to visibility impairment and are subject to BART. The fact that the summertime impacts are likely under-predicted as opposed to over-predicted adds additional we ight of evidence that the modeling indicates that these sources are anticipated to cause or contribute to visibility impairment.

4K r s

WEPA also speculated that since overall sulfate concentrations are being underestimated, predictions of potential visibility improvement are also likely being underestimated relative to what would happen in reality. Similar to the above discussion regarding general sulfate under-predictions, EPA did not provide sufficient evidence to support this suggestion. The potential visibility benefit due to controls is dependent on the dates at which improvements are evaluated as well as the relative distribution of species contributions (e.g., if the baseline impacts are primarily attributable to nitrates, potential under-prediction of sulfates is not likely to significantly impact the calculated improvement values).

Further, underestimation of sulfate concentrations is equally likely to occur during the baseline scenario as it is during the modeled control scenarios (CAMx Run 3 and Run 4), such that any potential under-prediction of sulfates in the baseline would be offset by potential under-prediction of sulfates in the control scenarios, making prospective under-predictions of overall visibility benefits miniscule. Thus, EPA is wrong to suggest a likelihood that visibility benefits are underestimated and should retract the implication that the CAMx predictions are skewed lower than what might be expected in reality.

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[190] See “camx_v630.EPA-R6-2016.TX-BART.CAMxRun1.final.xlsx” for base case model results, including species specifics extinction and total visibility impairment from each unit and subject-to-BART source. Similar data for the high control model results: “camx_v630.EPA-R6-2016.TX-BART.CAMxRun3.final.xlsx” and low control model results: “camx_v630.EPA-R6-2016.TX-BART.CAMxRun4.final.xlsx” are also available in the docket for this action.

WEPA's conclusion that visibility benefits are underestimated is flawed. As part of its evaluation of sulfates, EPA proposed that, given the typical sulfate underestimation bias, potential visibility benefits from controls also are likely underestimated relative to what is expected to be observed in reality. This conclusion lacks adequate supporting evidence. Potential visibility improvement values are dependent on the date under consideration, just as are the effects of bias on modeled sulfate concentrations. The distribution of species contributions also plays a significant role in the potential effects of sulfate bias on predicted improvement values. For example, if baseline impacts attributable to a source are primarily due to nitrates, sulfate modeling bias is not likely to substantially influence potential improvement values one way or the other.

Furthermore, it is equally likely that sulfate concentrations will be underestimated during a baseline scenario as it is during modeled control scenarios (CAMx Run 3 and Run 4), which means any potential underestimation in the baseline scenario would be offset by similar underestimation in the control scenarios, resulting in insignificant net underestimation of visibility improvement values. Therefore, EPA's suggestion that visibility benefits are likely underestimated is baseless, and the insinuation that CAMx-predicted impacts are lower than what would be expected in reality should be withdrawn.

o WAs we discuss in the CAMx Modeling TSD, because the base case model scenario utilized maximum actual daily emission rates year round, the total modeled emissions for SO_2 and NOx in the base case scenario were higher than the typical/actual emission inventory for 2002. This change in overall emissions could impact the overall chemistry and competition for reactants (e.g. ammonia) that lead to formation of visibility impairing particulate. We determined that the base case modeled impacts may be also be underestimated due to the higher overall emissions of SO_2 and NO_x in the base case model scenario. The control scenario runs, with cleaner ambient conditions, will not have this same effect and in fact the high control case with significant reductions from many major SO2 sources, could have the opposite effect as the modeled atmosphere is cleaner than actual conditions and there is less competition for reactants. The net result of this would be an under-prediction of base line impacts and over-prediction of control scenario impacts, and an under-prediction of the net visibility change (visibility benefit) between the two scenarios. Furthermore, visibility benefits of high control scenarios will be underestimated when the baseline visibility impact is under-predicted and the effect of the high control level essentially eliminates all sulfate impacts. We discuss comments concerning predicted visibility impacts due to sulfate and nitrate in response to comments above.

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WEPA failed to account for outlier emission rates consistently and modeled Nelson Unit 6 with incorrect NOx emission rates. The CAMx modeling on which EPA relied in evaluating the selected Louisiana BART-eligible EGUs was the same modeling utilized to support the Proposed Texas BART FIP.[191] However, EPA's proposed action here is inexplicably inconsistent with its action in Texas. In determining modeled emission rates for one of the Texas EGUs—Harrington Station Unit 062B—EPA acknowledged that the modeled NO_X emission rate was selected "after ignoring outliers that appear to be due to abnormal operations such as SSM."[192] Specifically, EPA opted to disregard the absolute maximum 24-hour NO_X rate of 28.454 tons per day occurring on January 11, 2004, in favor of the second-highest value of 19.231 tons per day.[193] Without explanation, EPA failed to disregard similarly anomalous data for Entergy's Nelson Unit 6.

The maximum daily NO_X emission rate at Entergy's Nelson Unit 6 occurred on May 8, 2000, with a value of 69.925 tons per day. The next-highest value is 41.147 tons per day—approximately 40% lower.[194] Compared with the Harrington Station Unit 062B, where the second-highest value is closer to 30% lower than the outlier, Nelson Unit 6's May 8, 2000 maximum is even more of an outlier.

EPA failed to recognize that the maximum NO_X emission rate at Nelson Unit 6 was an outlier and proceeded to model Nelson Unit 6 with excessively high NO_X emissions. EPA must be consistent in how it treats outliers when determining modeled emission rates. Choosing to ignore an outlier emissions value for one unit while subjectively failing to do so for another is arbitrary and capricious, invalidating the results of EPA's CAMx modeling with regard to Entergy's Nelson Unit 6.

o **W**Entergy submitted CALPUFF modeling to LDEQ as part of its BART screening and five-factor analysis. In their analysis, they identified emission rates based on a review of CEM data for 2000-2004 baseline modeling. We utilized these same emission rates as identified by Entergy in our CALPUFF and CAMx modeling to provide a consistent comparison between our modeling and theirs. We agree with the commenter that it appears that this emission rate is an outlier and that the next highest value is approximately 40% lower. We note that the commenter does not provide any additional information to verify that abnormal operations such as those associated with SSM occurred on that day.

LDEQ relied solely on CALPUFF modeling submitted to LDEQ by EPA and Entergy.[195] Our CAMx modeling supports the determination made by LDEQ that Entergy Nelson causes or contributes to visibility impairment at nearby Class I areas and is subject to BART. Entergy

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191 CAMx Modeling TSD, at 8.
192 EPA, TX187-0013-0025 – Modeling – CALPUFF_inputs, Posted Jan. 6, 2017, Docket No. EPA-R06-OAR-2016-0611-0013.
193 EPA, TX187-0013-0040 - Modeling - coal fired daily ei 2000-2004, Posted Jan. 6, 2017, Docket No. EPA-R06-OAR-2016-0611-0013.
194 EPA, Clean Air Markets Program Data, Continuous Daily Emission Rates for Entergy's Nelson Facility, https://ampd.epa.gov/ampd/#?bookmark=18881.
195 Updated BART Applicability Screening Analysis Prepared by Trinity Consultants, November 9, 2015. Available in Appendix D of the 2017 Louisiana Regional Haze SIP submittal, and DRAFT Technical Support Document for Louisiana Regional Haze: CALPUFF Best Available Retrofit Technology Modeling Review, April 2017 (revised May 2017 to include Entergy Nelson) Available in Appendix F of the 2017 Louisiana Regional Haze SIP submittal. EPA performed additional modeling for Entergy Nelson to address identified errors in some emission estimates.

Nelson has a maximum modeled impact of 2.22 dv at Caney Creek, with 31 days out of the 365 days modeled exceeding 0.5 dv, and 9 days exceeding 1.0 dv base on our CAMx modeling. Utilizing a lower NOx emission rate would not significantly lower the modeled maximum impacted day as this day and many of the days with modeled impacts over 0.5 dv, because these days are primarily impacted by visibility impairing particulates related to SO_2 emissions. For example, at Caney Creek on the highest impacted day, 94% of the total visibility impairment is due to sulfate. The average visibility impact across the top ten CAMx modeled days is 1.36 dv with an average of 31% of the impact due to nitrates. Reducing NOx emissions by 40% or even eliminating nitrate impacts all together still would result in modeled impacts from the source to be well over the 0.5 dv threshold and the magnitude of impacts from sulfates would likely increase with less nitrate competition for available ammonia. Similarly, our CALPUFF modeling showed a maximum impact[196] of 1.251 dv at Caney Creek, with 34% of that impact on that day from nitrate. The contributions from sulfate alone result in a modeled impact above the 0.5 dv threshold.

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Comment: Entergy's sources should not be subject to BART. Entergy disagrees with EPA's proposal to approve LDEQ's conclusion that Entergy's Waterford, Willow Glen, Ninemile Point, and Little Gypsy plants are subject to BART.[197] For the reasons explained in these comments, the CAMx modeling submitted by Entergy in the November 2015 Submittal represents the most reliable estimation of baseline visibility impacts from Entergy's BART-eligible facilities. Based on this CAMx modeling, Entergy's sources should not be determined to be subject to BART. Nonetheless, assuming EPA finalizes BART determinations for these facilities, Entergy agrees with the proposed BART limits.

Entergy's CAMx modeling utilized realistic actual emission rates and evaluated visibility impacts relative to IMPROVE monitor data through the use of RRFs to obtain the most realistic possible assessment of potential visibility impacts from Entergy's facilities on Class I areas. Table 2 below presents the facility-wide impacts for Entergy's Waterford, Willow Glen, Ninemile Point, and Little Gypsy plants at the Breton Wilderness Area. The modeled impacts during the 20% worst visibility days are minuscule – all less than 0.025 dv – indicating that the BART-eligible units at these facilities contribute only minimally to visibility impairment at Breton. Because these sources are "not reasonably anticipated to cause or contribute to any visibility impairment in a Class I area,"[198] Entergy's sources should not be found subject to BART.

Table 2. Maximum Contribution to Visibility Impairment at the Breton Wilderness Area During the Worst 20% Visibility Days[62]

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[196] For CALPUFF modeling to assess the maximum impact we analyzed the 98^{th} percentile or 8^{th} highest modeled day
[197] Proposed Rule, 82 Fed. Reg. at 22,942.
[198] BART Guidelines, 70 Fed. Reg. at 39,161.

Entergy Facility	Visibility Impacts (dv)
Waterford	0.025
Willow Glen	0.0093
Ninemile Point	0.0055
Little Gypsy	0.0036

Nonetheless, assuming that EPA's final rulemaking continues to find that the Waterford, Willow Glen, Ninemile Point and Little Gypsy plant are subject to BART, Entergy supports the BART limits that LDEQ adopted into its SIP. The limits represent appropriate BART determinations for these sources.

o **W**We agree with LDEQ that the CALPUFF modeling following the reviewed protocol is an appropriate tool to evaluate visibility impacts and benefits to inform a BART determination. With the use of CALPUFF modeling results included in the LA RH SIP, Louisiana concluded, and we are finalizing our approval of that determination, that the BART-eligible units at Entergy Waterford, Willow Glen, Ninemile Point, and Little Gypsy have visibility impacts greater than 0.5 dv and are therefore subject to BART. Accordingly, LDEQ performed the required five-factor analyses and made BART determinations for these subject to BART sources. As discussed elsewhere in this document, the CAMx modeling presented above does not properly assess the maximum baseline impacts and is inconsistent with the BART Guidelines. We consider this submitted CAMx modeling to be invalid for supporting any determination of visibility impacts below 0.5 dv.